RECORD

Collection and Field Note Book

No. 44

(April 20, 1956 - June 3, 1956)

(36925 - 37261)

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April 20 - The road from Kuala Lumpur to Seremban is almost entirely through rubber plantations. Many of these are mature, but some are quite young. There is considerable replanting going on. The old trees are poisoned, and when dead, cut for firewood. This accounts for the areas of whitened skeletons seen from the plane on April 18.

The dark green trees in close rows, seen then, are also rubber, planted in "hedge" style, with the trees very close together in rows, a double rows, with wider spaces between the rows. This is supposed to save labor in tapping.

Generally the spacing is so close that the crowns touch all around. The cleanness of cultivation varies in different estates. Formerly clean cultivation was considered best. Now cover crops, weeds, selected weeds, etc. are left on the ground on many estates. An argument for clean cultivation is that weeds or

other plants which come as high as the tapping panels seem to encourage fungus attack in these areas.

At this season the trees are in somewhat less than full leaf, making them a rather uneven grayish green. Later they are much darker green, and cast a denser shade.

Planting on steep hills is prohibited unless terracing is undertaken. This is the contouring seen from the plane.

Just before reaching Seremban the road crosses a range of hills which are covered by forest reserve. This is rather nearer hill dipterocarp forest, even though it is at a very low altitude for this. It is an example of the depression of altitudinal zones seen in coastal and isolated mountains and hills. It has been rather degraded by logging. A scattering of ~~Shorea~~ Shorea curtisii is visible ~~because of~~ marked by a gray color, from a distance.

Scattered here and there in low spots all the way to Seremban are clumps and small patches of Metroxylon. Whether this indicates swamp is not always obvious. It may be used principally for thatch, though the sago also is used, at least locally.

Between Seremban and Port Dickson again rubber estates predominate. On a low range of hills there is young forest, very tangled, perhaps up to 10 m. high. This was cleared by the Japanese during the war. It has grown up to "belukar" or second-growth but with a good crop of dipterocarp seedlings nursed by the secondary vegetation. several miles north of Port Dickson mangroves appear in low spots. Otherwise low places are occupied by rice, or if not too low, by rubber, which seems to do well on low flat rather poorly drained soil.

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April 20 - Sungai Menyala Forest Reserve, 6 mi. southeast of Sat Dickson
Primary rain forest, lowland dipterocarp type, on low flat ground

36925 4	Carinta	common locally in
1 26	Carinta	common locally in
3 27	Ixora	common in openings in

→ A sample plot in this reserve seems to be partly, at least, virgin lowland dipterocarp forest. The trees over 4" dbh. have been enumerated, numbered, and identified.

The ground is flat, with no marked irregularity. The soil is a yellowish gray brown at the surface, ~~&~~ feels like a fine silt with a little fine sand. Surface covered by a thin, rather continuous litter of dead leaves. No marked

Rainfall: at Port Dickson 90-90"; well distributed.

5 mi

prostrate, extensively creeping herb; peduncles erect; fruit black, glossy, fleshy.

fruiting stems erect from creeping rhizome; fruits purple-black, glossy.

shrub 1-2.5 m. tall; flowers deep orange, in red panicles.
"bunga siantan"

darkening by humus. It is apparently fairly deep.

This forest has an irregular canopy, in places dense, in places rather open, about 30-35 m. high. Taller trees are in groups, reaching considerably taller.

The canopy trees are from 3-5 dm. dbh., the emergents, about 1 m., larger and enormous 'banir' spurs

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seen 15+ dm. diam above buttresses. at its base was a huge mound of earth about 1.5 m. high around and between the buttresses. This turned out to be a termite nest. Most of the large trees here are buttressed.

An irregular second story seems to be about 20 m., of trees 1-2 dm. dbh.

A definite shrub layer, 2-5 m. high, stems about 0.5-1 m. apart, easy to walk through; ~~often~~ young rattans, mostly still in rosette stage, rather common. Melastomaceae common also Ixora.

Locally there is a sparse but very definite ground layer of Carinta (2 spp.), a few ferns, and seedlings of various trees. These latter may persist in a dormant stage a few dm. tall or less, for a number of years, shooting up if an opening occurs to let in light.

In a small opening, at least 10 years old, were saplings of dipterocarps from 3 to 6 m. tall, but

Big trees
Koompassia
Shorea leprosula
Shorea acuminata
Shorea curtisii
Dipterocarpus crinitus
Dipterocarpus cornutus

rather few of them. Also Ixora, and a big Sansevieria. This was essentially still an opening, after 10 years, with the ground between the bushes quite bare. In an opening caused by fall of a large tree, more recently, there were also a few fairly large saplings, many smaller ones, some Ipomoea and other weedy things.

Lianes are not especially abundant here but are sometimes very large, one seen 15-20 cm. diam.

After these forests are logged out, the remaining trees are frill-girdled and then poisoned with sodium arsenite. It takes them up to 1 year, or even 18 months, to die, and one ~~year~~ to five years to rot and fall down. The tangle of climbers and saplings which follows is open beneath in 3-5 years, and may be from 10-12 m. high.

April 20 – About 6 miles southeast of Port Dickson, along coast road.

Along the inner edge of the mangrove swamp coconuts have been planted, even a hundred yards or more out into the mangroves. ~~which~~ There has been an attempt to drain the swamp by ditching. The coconuts look very sick, with small crowns of yellow leaves. In the swamp here, are bushes of Lumnitzera littorea 1-1.5 m. tall, and Pluchea indica, small clumps of Acrostichum aureum, patches of Ischaemum and a fine wiry grass, possibly a form of Sporobolus virginicus.

Nearer to the sea, a mile or less along the road south, where the swamp is better developed, the trees larger, Lumnitzera, Avicennia and Rhizophora make up the vegetation. The trees here are ± 5 m. tall. Large spaces between, irregular, are filled with steep conical mounds of

dried mud to 5–6 dm. high, each with a hole in the top. They are said to be made by crabs.

Examined beach and rock along coast 5 miles south of Port Dickson.

The beach is of fine quartz sand. Casuarina trees are common. Scaevola sericea locally forms a strip to 2 m. high, with some Ximenia americana. Ischaemum muticum, Sporobolus virginicus, and Ipomoea brasiliensis are common along the beach.

On the rocks, which are like a thick laterite iron pan (see sample), there are thickets of Hibiscus tiliaceus, also Eugenia sp. On bare spots Gleichenia linearis comes down to within a few feet of high tide mark.

Some of the same rock forms a reef a few meters out from the beach.

This is said to be the only place where there is sandy

1956 Malaya – negri sembilan

beach along this whole coast. It is a rather poor narrow beach.

In intervals in the beach there is a strip of mangroves. Here the outer belt is mainly bonneratia, which actually grows out in the shallow water on sand bottom. The bonneratia is tall and spirelike and light colored than ordinary mangrove, and does not look exactly right from the air. Probably the outer belt seen from the air in Johore was bonneratia rather than casuarinas.

April 21 – trip by road from Kepong to Fraser's Hill.

From Kepong where the road branches off to follow up the Selangor River valley into the mountains is almost solid rubber plantation, with an occasional small patch of belukar.

In the river valley the steep walls are covered by a mixed forest, doubtless lowland dipterocarp forest at the base, changing to hill dipterocarp further up.

In the valley bottom is belukar with a great deal of a slender bamboo. Small rubber plantations are scattered here and there where the land is reasonably level. The lower slopes are also belukar with bamboo. A small tree, Pentaspadon officinalis, is commonly flowering in the belukar.

At milepost 47 good hill dipterocarp forest may be seen across the

valley where the ridges are well marked by the gray crowns of Shorea ~~Calophyllum~~ mixed with the yellowish ones of Koompassia.

Going upward the Selukah has more and more primary forest trees in it. Steep banks and cuts are covered by Blechnum orientale, Gleichenia, small vines, etc.

Upward, the forest near the road is very uneven. Big trees have been removed and there is much bamboo and tangled growth.

Near 2000' altitude the forest is less degraded. Large trees are mostly dipterocarps but there are some beautiful Koompassia.

From here up to 2800' hill dipterocarp forest is well developed. A beautiful arching bamboo with broad leaves fills the spaces where trees have been removed and the clearings. There are some rattans and tree ferns. Ferns are more abundant upward.

Shorea platyclados has a beautiful straight trunk and handsome crown.

At the gap, 2800', and for some hundred feet higher there is still hill dipterocarp forest. Tree ferns are common.

Upward the forest is dense with less bamboo. It is very mixed, stature seems a bit lower, climbers are more abundant.

The tree ferns seem to be more in ravines and in old disturbed places.

Dipteris is common on cuts and slides, as well as Blechnum and Gleichenia. Other Gleichenias than linearis are coming in.

As milepost 61 is passed the forest takes on more and more the character of montane rainforest, but there still are plenty of dipterocarps. It has been much disturbed. By milepost 62 we are in montane forest.

There are landslides on steep slopes, covered by Gleichenia. Ferns generally, are now very conspicuous, as well as all kinds of epiphytes.

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April 21 – Fraser's Hill.
Montane rain forest on ridge

36928 Nephrolepis
occasional on stumps and fallen logs

1 29 Cephaelis
rare

1 30 grass
common along trail

1 31 Hymenophyllum?
on tree trunk

3 32 Saurauia
rare in

1 33 Freycinetia?
common in

34 myrs.
in deep moss beside trail

2 35 Mussaenda
in undergrowth

1 36 Panicum
rare along trail

3 37 Chloranthus
occasional in

1 38 Psychotria?
rare in

1 39 Ardisia
rare in

1300-1400 m

shrub 1 m. tall; flowers cream white. erect, single stems or several together.

large shrub, a small tree 5 m. tall; flower clusters on trunk; buds red outside pink, inner ones white with pink midrib, petals white, recurved. climbing; fruit immature.

fruit secund, crimson.

climber, twining in shrubs, enlarged calyx lobe ~~white~~ white corolla bright yellow; hair on petiole maroon. capsule

shrub 2 m. tall; ripe fruit yellow.

shrub 1 m. tall; buds white, slightly purplish. slender sparsely branched shrub 1 m. tall; fruit crimson.

36940 Joinvillea elegans
3 common in openings and
along trail

Fraser's Hill is a
rather recent ~~so~~ resort
settlement with many
winding roads and
bungalows, situated
on the main crest of
the mountains between
Pahang and Selangor, at
somewhat over 4600 feet.
There is much planting
of ornamentals, pines,
araucarias, Eucalyptus, etc.
around the settlement.
Cleared areas, where not
in lawn & garden, are
occupied by a lush tangle
of ferns - Dicksonia, Athyrium,
etc. Joinvillea, a reed that
looks like Phragmites, bushes,
etc.
The ridge forest varies
considerably in stature,
in some exposed places as
low as 10 m. mostly 20-30
m. The trees seem to be
of all heights, with no
distinct layering
evident, except a ~~[illegible]~~
shrub layer and a herb layer.

emergents, canes
up to 4 m. tall; ripe
fruit deep orange red.

Light is cut off very
effectively by the trees
so that little if any direct
sunlight hits the ground.
Tree genera seen or and
recognized on the ridges
were Weinmannia (Alumii?),
Podocarpus, Quercus,
Castanopsis, Pithecellobium,
Eugenia, Cyathea, Canyota.
In a group of especially
tall trees on a low part
of the ridge were Buckland[illegible]
(or is Lyminghtonia correct name?),
Litsea, Cinnamomum (cinereum?),
and Calophyllum.
Epiphytes are abundant
on the trees, as well as
creepers, especially those
that cling close to the bark.
Of epiphytes bryophytes, orchids,
ferns, incl. filmy ferns, lichens
are most common, though
Ficus and such, which
eventually reach the ground,
are common enough. Drynaria
and Asplenium nidus are
conspicuous. Fungi and tubercles,
probably from Drynaria, are

seen fallen on the ground.

The shrub layer is rather dense, 2-4 m. high and too thick to walk through without cutting. In it are many melastomes, a large Athyrium, many rattans, an abundant semi-climbing palm - Areca or Pinanga, and a small fan palm, as well as Freycinetia, Pandanus (rare), Amomum and other zingiberaceae, Chirantha, Blechnidium, Dipsaceae (climbing), and several other small Rubiaceae.

There is a distinct herb layer of ferns, Selaginella, Elatostemma, gesneriads (incl. Didymocarpus spp.), and melastomes (?), and abundant mosses, incl. a very large dark green one.

The soil has an accumulation of several inches of raw humus, overlying a fine gray-brown silty or clay soil. The weathering is apparently fairly deep.

On low gaps and in ravines the epiphytes are more luxuriant. The undergrowth also is more abundant, and includes a greater abundance of small palms and zingiberaceae, as well as a slender Musa. Leaf epiphytes are conspicuous, as is Asplenium nidus.

On steep parts of the ridge an elongate climbing bamboo becomes very common. On level parts toward Pine Tree Hill the trees are tall, about 30-35 m. and the canopy is denser. The undergrowth is correspondingly sparser and more open.

On slopes (45°-75°) on sides of ridges the trees are tall, 30 m. or more, there is no sign of definite layering above the shrub layer, which is denser than on ridges. The canopy is rather uneven. Ferns and rattans are abundant in shrub layer. Epiphytes and herbs are abundant. Principal trees seen are Quercus, Canarium, Eugenia,

Xerospermum, Barringtonia,
Beilschmiedia, Phoebe,
Calophyllum, Litsea,
Parinari, Vatica, etc.
Several specie of Lauraceæ,
Amomum, Cyathea, palms,
etc in undergrowth.
Lianes and other
climbers abundant.
Mosses and filmy
ferns are conspicuous.

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April 22 – Kepong Forest Research Station

36941 Melastoma malabathricum
bushy roadside

1 42 verb.
common on bushy roadsides and in young planting of trees

1 43 Cyperus
occasional in grassy roadside

2 44 Selaginella
common in second growth

1 45 Asconpus compressus
very common in grassy places and on trails.

1 46 Upuna borneensis
~~[illegible]~~ planted in arboretum

1 47 Shorea acuminata Dyer
planted in arboretum

Selangor

shrub 2 m. tall, flowers rose pink, filaments curved.

small tree 4 m. tall, flowers greenish and violet, filaments long, curved, white. roots fragrant.

climbing

young tree 6-8 m. tall.

tall tree 25 m. tall, fruits and leaves picked up from ground beneath. gum exuded from scars on trunk, hardened.

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April 22 - Air trip from Kuala Lumpur to Singapore (straight from Kuala Lumpur to Malacca then along coast) (from southwest side of Island).

The outwash from tin mines is white sand, the actual mines are variolored, from red to brown, yellow, white. They are roundy ponds, some of them very green. The white sand is in places gravelly, revegetated.

Tin area near Kuala Lumpur some of it, hills, are covered by lalang (Imperata), others by Gleichenia. The two are nearly the same green, but lalang is somewhat lighter. Gleichenia brighter.

Most part of Kuala Lumpur is mostly in rubber plantations. Much of this is in hedge style planting, either in straight rows or maze-like.

The country is hilly but mostly in rubber except a few lalang patches and a very little forest along several closely meandering rivers. The lower into the

meanders are grassy, the part back of the grass is wooded, as well as the concave sides. Rubber on both sides.

Young rubber is usually deep green and with a closely tessellated pattern & texture. The older rubber is grayish green at this season and has a much less well defined texture.

Southeastward are some higher hills with forest (definitely darker green than rubber and mixed spotting of different greens) and patches of bright green lalang.

In valleys to southwest brownish rice land & some dendritic strips.

Some tin mining on rivers southeast of these hills. Rubber between these rivers. The rivers are a café-au-lait color.

As we get nearer the coast ~~the~~ the hills are lower and all in rubber - a few forest just inland from an odd-shaped finger-like cape. South of this is a conspicuous estuary

1956 Malaya

with a rather broad area of mangrove extending well inland. Here are some patches of forest and some brushy fern land much new rubber plantation contour terraced. There are less plantations than in most places, especially less mature ones. Some rice-land in dendritic strips - dirt colored at this season. Southward are many newly-terraced patches, bare and pinkish white.

Rice becomes dominant southward and nearer the coast, around Malacca; and south of it, in a definite narrow band behind a narrow mangrove belt. A few tiny sandy beaches either red or white, a bit south of Malacca.

One hour south of Kuala Lumpur - 3 large canals cut from inland to the sea - for drainage?

In the large bay south of the last headland before Johore Strait are curious cusps & points projecting out at right angles to the

mangrove shore. Points are apparently of mangroves. Thus:

How can features like Johore Strait, of which there are several also on the northeast coast of Sumatra and the east coast of Borneo. They are narrow arcuate channels cutting bite-like islands out of the coast.

A

1956 Malaya

April 23 - Singapore Island
The Gap

A small hill, beside the Gap, may be considered typical of a considerable amount of land on the sedimentary hills of Singapore. It is of sandstone, with the soil completely eroded off of the upper parts, except for what is held in pockets, and that is filled with broken rock and bits of ironstone (indicating that the soil, before the erosion, was severely laterized?). Lower slopes with deep soil, but very deeply gullied.

On the slopes the principal plants are: Adenandra sp.
Gleichenia linearis
(grass Schoenus)
Galearia sp.
Dillenia suffruticosa
Lycopodium cernuum
Ficus alba
Myrica sp.
Fagraea fragrans (small sapling)
Lauraceae
Rhodamnia
Nepenthes sp.
Bromheadia? (orchid)
Clerodendrum sp.
The vegetation is of very

low stature, 0 - 2 m. tall, varying from sparse, bare ground even, to closed and grassy a sward.

The top of the hill affords slightly more favorable conditions, with a small relatively flat area. Here as
Melastoma malabathricum
Schoenus sp.
Imperata cylindrica
Blechnum orientale
Cordia cylindrostachya
Pronabelus (large, elongate-like)
Digitaria setacea
Cleistoplopogon aciculatus
Cyperus sp.
Panicum sp.
in addition to the plants found on the slopes. Dillenia and Ficus form low thickets, 2 m. or so high.

April 23 - The Gap

40-70 m.

eroded land with sparse grass and shrubs on sandstone.

36948 Melastoma malabathricum shrub, at base of hill

49 grass? tufted

very common even on most eroded places

50 Clerodendrum shrub 1-1.5 m. tall.

occasional

51 Ficus alba shrub 2 m. tall, leaves

occasional in scrubby spots. variable in outline.

52 Adenandra shrub 1.5 m. tall.

common

Pandan

April 23 - [illegible] (?) Rasau

0 m.

Mangrove swamp

53 Avicennia officinalis small tree, flowers yellow.

common in interior of swamp

54 Pavetta woody scrambler, flowers

rare in interior of swamp white.

54a Dischidia rafflesiana creeper, pitchers laterally

rare epiphyte, on Lumnitzera compressed, inhabited by

near inner margin of swamp small ants.

(1) 53a Dalbergia candenatensis Prain = D. torta Grah. det. H.M. Burkill scandent

scandent edge of mangove swamp

April 23 - The Gap

65 m.

52a Nepenthes

on badly eroded slopes of sandstone with scattered shrubs and sparse grass

1950 Malaya

Pandan

April 27 – ~~Caesar~~ (?) Nature Reserve -

"wet mangrove swamp"

This is a rather extensive area of mangrove of rather low stature. The substratum is mud, which in even a small opening, is built up into steep conical mounds with holes at the top, said to be built by fiddler crabs. There would protrude above most high tides. and very few of them have any plants growing on them, occasionally a young Acrostichum.

The principal trees here are Avicennia officinalis, Bruguiera sp. (small fld. like Maldive sp) Rhizophora apiculata (?), R. mucronata, with Lyphiphora hydrophyllacea and Acrostichum common enough. Lumnitzera and Bruguiera only seen toward inner margin of swamp, the Bruguiera very rare. Dinchidia rafflesiana seen only on Lumnitzera.

Along road across swamp, many more plants are to be seen. These are on ground covered by salt water at highest spring tides. Those seen were:

Hibiscus tiliaceus
Morinda citrifolia

Acanthus ilicifolius
Randia sp.
Allophylus sp.
Lygodium scandens (?)
Derris trifoliata
Pavetta sp.
Glochidion (a Phyllanthus) sp.
Excoecaria agallocha
Dalbergia (vine)
Wedelia biflora
Clerodendron indicum
Cyperus sp.
Caleria sp.
Melastoma malabathricum
Nephrolepis biserrata
Dillenia suffruticosa
Ipomoea pes-caprae - sp. Bracteata.
Flagellaria indica

From boat along north side of estuary the swamp is rather uniform, the trees back from the edge reaching to 10-12 m., much lower along edge. This stand is 20 or more years old. The plants seen are

a Rhizophora apiculata
c R. mucronata
c Avicennia officinalis
l Sonneratia sp. (only toward head of estuary)
o Lyphiphora hydrophyllacea.
o Bruguiera (small fl.)
r Nypa fruticans

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The top of the canopy here is very uneven. The aerial roots of both species of Rhizophora generally originate 1.5 m. or less above base of tree, but occasionally 2 m. or higher, even coming down from branches. The roots may arch secondarily twice or more times, branching each time.

On the south side of the estuary the stand is of more even height, though varying from place to place from 3 to 8 m. Some doubt if this was cut during war, but may have been, at least in places.

On this side Kandelia is more common. There is also more bare soil exposed at low & mid tide. Rhizophora mucronata is more common here, but occurs as single trees. The leaves of this are broadly elliptic, broadly acute, almost obtuse, the cymes 4-flowered, drooping. The radicle up to 0.5 m. long. The roots on this rarely originate from as high as 2 m.

The other species, commonly called R. conjugata (but incorrectly acc. Merrill) has narrower and smaller leaves, very slightly accuminate (looks a little like Bruguiera conjugata). Its inflorescences are here uniformly 2-flowered, stiffly divaricate from stem, very short. The radicle (scarcely any seen at this season) only 10-20 cm. long.

Inland from swamp are ponds for culture of prawns. The mounds built by fiddler crabs are conspicuous in these.

1954 Malaya

April 23. Water catchment area —

Mostly "belukar" or secondary growth, in fairly advanced condition. A thick stand of ~~poles~~ pole-sized trees, about 15 m. tall, to 10 cm. dbh., including Ficus spp., Symplocos, Oxymitra, etc. Undergrowth rather thin locally, with a few rattans. Borders are lined with ~~as~~ luxuriant Gleichenia linearis.

Several small areas of swamp forest.

In one the peat is over 1 m. deep in center — is really a muck rather than peat. At this season mostly firm enough to walk on, usually has standing water.

General height of trees about 20 m., a few large emergents. Trees mostly small, canopy uneven. Palms, Pandanus and Cincosperma common. Little undergrowth, some Nannalomena on ground but sparse and irregular.

Another Pandanus path, has trees irregular in size, but a full canopy at about 20 m., some trees to 30 m. or more.

There is rather thick undergrowth up to 4-5 m. tall, with many rattans and some Freycinetia, many shrubs and vines. Very tangled ~~in~~ under ~~some~~ both thin and dense places in canopy. Trees generally buttressed. Stilt roots common, even on shrubs. Some Pandanus and Cincosperma.

Ferns common, both as ground and epiphytic. Many epiphyllous hepatics.

Ground a deep soft muck, with a little standing water in place. Cryptocoryne common in spots, where undergrowth not too dense.

1956 Malaya

April 24. Flight Singapore to Bangkok.

Areas of low mang rove around east end of Johore with winding tidal streams a sound indet, suggesting a drowned coastline. All higher ground seems to be in rubber plantations except a cluster of low hill which had many ridges and thickets in the ravines.

North of this a short distance the country is low hilly and solidly treated. These hills have large emergent trees, the low places between them have a very smooth canopy, possibly swamp.

Northward over the cloudy N.E. coast is approached. The country is forested but with many patches of belukar.

Just back of the coast the streams meander intricately in what must be swamp forest. They are not at all muddy but very dark. Coast has sandy beach, the sea is blue not at all muddy.

There are many small clearings immediately along beaches. Crossing the bulge of the east coast streams trend east through low forested country, meandering with many oxbows. They are very muddy. Along the streams are many clearings and patches of belukar. The hilly country to the north is densely wooded, with a few clearings at first, then as it gets rougher, none at all, but dense virgin forest, with emergent trees clearly visible from 16,500'. Then, low hilly country with muddy streams trending eastward. Many clearings along larger streams. Landslide scars clearly seen. Abundant cumulus clouds. Large river leaving hills, enters lowland and starts to meander. Along meandering part is extensive clearing. running up to forthills even far away from river. A little shifting cultivation along river in hills. The lowland here is very largely cleared or in belukar or rubber. It is hard to distinguish

the rubber with certainty from 1650'. Considerable patchwork in lowland and on low hills, shifting cultivation on somewhat higher hills.

Ac coast is approached again, mostly forest, little clearing except on immediate coast near Trengganu and back from it northward. North of Trengganu is an extensive system of old beaches and dunelines, ponds back of present beach, and a meandering river trending along the coast back of the dunes in a swamp forest. Long lines of sand with sparse scrub and thin lines of woods or brush. (This is opposite ~~Tat~~ Pulau Redang and the islets northwest of it.)

April 24 - Approaching Thailand from south - islands and headlands on east side of gulf of Siam - much cleared land in lowlands, hills largely wooded but poor looking woods. Rock showing through on islands. Bays to east are lined by reddish beaches. Some red erosion scars on land in lowlands. Islands are high, not especially rough, shore

of reddish rock with white beaches. Islands are not a scarcely cultivated, at least on west sides. Smallest of them are completely denuded, almost so.

Sea at head of gulf very muddy, much very low mangrove along coast, cut into by rectangular patches [salt farms]. Then a strip of solid cultivation - open fields. Then a strip that appears to be mangrove, also along big river estuaries, but this is really thickly settled land with miscellaneous cultivation - coconuts, bananas, etc. many trees. Strips of houses with abundant trees along watercourses, many small isolated patches, too. All else rice fields - brown now.

Driving to Bangkok from airport — rice fields, house sites surrounded by bamboo clumps and trees. Along road are canals filled with Eichhornia, Pistia, Polygonum, and other water plants.

Bangkok a very open city, with considerable ground in gardens and trees. Only locally congested.

1956 Thailand

April 27 - Wang Noi

Market - fruits & vegetables for sale:
mangoes
pineapples
~~Bactrea~~ Baccaurea rapida
Sandoricum indicum
bananas
Curcuma sessilis & C. aeruginosa
Neptunia oleracea
Cocinea indica
Spondias pinnata
Acacia ~~sinuata~~ concinna
Cucurbita moschata
jack fruit

This whole area, from Bangkok to the Rapipat Canal is perfectly flat low-lying rice land, flooded every year. Houses and villages are like islands, marked by abundant clumps of bamboo, and by trees: — mango, Elaeocarpus and Combretum quadrangulare.

The fields are separated by low dykes. Have been lying fallow, or just being plowed. Soil dark, brownish gray. The dark layer is, in places, only a few inches deep, over a tan colored subsoil. In other spots it is considerably deeper.

East of the Rapipat canal, about 2nd km, the land changes abruptly. It is slightly higher and not flooded, though equally flat. The soil is very pale - the surface cream colored, somewhat darker café au lait below. It is watered only by rain. The fields are separated by high well kept dykes of mud. Much more labor is involved in producing rice here. The soil is more sterile. Scattered abundantly over the landscape are trees, a few clumps of trees, a bamboo, said to be left for shade ~~also~~ for workers in the fields. The base of each clump has a mound of soil up to 1.5 m. high, light gray-brown, built up by termites. Seven species of trees are found here, and a number of herbs and shrubs. These mounds are scattered over the landscape, spaced from 50 m. to 200 m. apart, giving the entire landscape, from the canal to the foot of the hills near Purkat Garden, a strange character. They become more frequent toward foot of hills.

1956 Thailand

April 27 - Pukae Botanical Garden

a black silt soil, comparable to the black cotton soils of India. When moist is very plastic and stiff. According to test of colloid content by Conco titration but has a colloid value of 10 - called a loamy sand. However, texturally it would be certainly a silty clay or silt. There is no sand, whatever, but the colloid content is exceedingly low.

The natural forest on this soil was dry evergreen forest, with Dipterocarpus alatus, Lietia, Anogeissus acuminata, Trewia nudiflora, ~~It is also~~ Homalium, Alangium, Dischoffia javanica. None of this forest left here now. It is an alluvial plain at the foot of limestone mountains. Much of the garden is in low secondary thicket with scattered trees, much of this has been cleared except the trees, which are perhaps 10-30 m. apart, some large near the river (a canal), lower farther away.

North of Pukae and extending south and east is a range of high limestone hills and buttes. They are of a bluish massive limestone. Their sides tend to be steep to vertical with talus slopes at base. This limestone possibly is the parent material of the black soils to the west, even though there are ridge sandstone. They seem to be on silt plains, the silt of which may, at least in part, come from here.

The slopes of these hills are thinly wooded, except on vertical faces, which are mostly bare, especially on the west and southwest sides. This wood is burned over annually, for no apparent reason except carelessness and using fire to scare out deer. The result is that the vegetation is less well developed than it would otherwise be.

1956 Thailand

The branch road to Ayutthaya runs through vast rice fields, in places thickly strewn with houses, in others without a house or even a bush for miles. The houses, as usual, are surrounded by a clump of bamboo or by a veritable thicket [illegible] of it. The hedge bamboo is said to be spiny.

As the river is approached near Ayutthaya, thickets become numerous and extensive alternating with rice fields and houses. Ruins of masonry structures become more and more frequent, half covered by thicket. The old capital, at Ayutthaya, was destroyed by the Burmese about 200 years ago. There is still much settlement here, especially along the river, but not much city is yet evident.

April 27 - Pukae Botanical Garden

36995a Dipterocarpus

1

1956 Thailand

a/m. 29 - Bang Djark, just southeast of Bangkok. Along tidal channels between rice fields and road.

36955 Sonneratia acida
common

3 55b Emilia sonchifolia
local on railroad embankment

with Acanthus bracteatus, etc.

tree 10 m. tall, flowers with narrow deep purple petals, white stamens, flowers light purple

1956 Thailand

Along road east are flats covered by a grass, possibly Paspalum vaginatum with Pluchea indica, Acrostichum, etc, Father on replaced by Sonneratia caseolaris and Lumnitzera with Paspalum.

Further east are Avicennia flats, a open stand, but kept very low, 1-2 m. by continued cutting, even of small sticks for firewood.

This road runs eastward parallel to the coast. eastward the mangrove becomes more diversified with patches and single plants of Rhizophora, and other mangrove species, areas of Nypa and of Acrostichum. The general background is usually Avicennia, perhaps 2 species. The Rhizophora appears to be R. apiculata or something similar, some R. mucronata locally. The trees seem not to reach more than 5-7 m. Probably the Avs are always cut before they get any larger.

Nearer the Bang Pa Kong River some Sonneratia is to be seen, but Avicennia is found also in pure stands again. For one km. or so on each side of the river the vegetation in patches seems to be dominantly a low tangle of Derris trifolia and some Acrostichum. with considerable mangrove in large areas of Nypa swamp. Southward toward Cholburi there is some slightly higher ground with mixed cultivation, alternating with mangrove swamp.

All the way east from somewhat south of Bang Kha the road seems to be a sort of boundary between the salt-tidal influence and fresh water rice fields. A large canal runs inland of the road - excavated to provide the earth for the road fill.

Between Samut Prakan and Bang Pa Kong, on the seaward side of the road are extensive "salt farms" - evaporation

beds cleared from the mangrove. These are only used during the dry season.

Toward Bang Pa Kong there are, again, some Imperata flats on both sides of the road. The Imperata varies, from plant to plant, from a bluish or grayish green to a reddish purple.

There are also flats of Lepturus and of Paspalum. The Lepturus is somewhat different from that in the Pacific. Leaves are dull and flattened, stems not conspicuously red, flowers tiny. Mainly miscellaneous cultivation.

The area from Chulluni to Bangpaen is varied, from low marshy or swampy areas to dry land and even a few small hills. Coconuts are planted generally on higher ground and attempts are being made to plant them on ridges piled up in the swamps and marshes. Tapioca is generally grown on

ground slightly higher than the marsh rice in nearby land that is not in use. Coconuts and Borassus abundant.

Near Bangpaen is a small area that is in rice and other cultivation, but has scattered clumps of shrubs or trees, & bamboo, with huge mounds of earth, probably Termite mounds, many Borassus, in rows and clumps.

At Bangpaen is a sand flat, quite broad, with many weeds, especially Vitex procumbens and several wiry sedges. Here are Ipomoea pes-caprae, Vitex ovata, Vigna(?) sp. Tribulus cistoides. In low spots Saccharum spontaneum, a very slender variety.

Borassus

An isolated hill of quartzite has on its seaward side thickets predominately of a stiff bamboo. On the other side a dense tangle of shrubs, small trees, and vines. On ridge a scrubby forest, esp. Ficus aff. religiosa.

1956 Thailand

April 29-30, Bang Saen
sand flat back of beach

2	36956	Ipomoea pes-caprae common	prostrate, flowers bright purple.
1	57	Boerhavia very common	leafy stem prostrate, inflorescence ascending; flowers red.
2	58	Saccharum spontaneum L. very local	forming dense brake 2 m. tall
1	59	Boerhavia diffusa uncommon	prostrate, flowers pink.
~~2~~	~~60~~	~~Ficus aff. religiosa~~ ~~common~~	
3	60	Vitex common	prostrate with erect flowering stems, extensive; flowers violet outside, pale within.
2	61	Euphorbia occasional	stems ascending, somewhat arched,

April 29 Bang Saen, Khao Sommuk
hill of quartzite

3	62	Boerhavia abundant along road and on talus	prostrate, inflorescence ascending; leaves white beneath.
2	63	Ficus aff. religiosa common on	small tree, roots running down over rocks; ripe fruit purple.

1956 Thailand Phra

April 30 Bang Saphan

Sandy flat backed beach, with sand and mangrove swamps.

36964 Ceriops
1 very common in small mangrove swamps.

1 65 Borreria
occasional on sand

1 66 Avicennia
common in small mangrove swamps

2 67 Ipomoea pes-caprae
common on sand flat

2 68 Fimbristylis
common on sand flat

bush 1 m. tall.

prostrate; corolla ~~flower~~ white tube slender.

shrub 1 m. tall; flowers orange.

prostrate, extensive; seeds on ground.

caespitose, leaves stiff.

1956 Thailand

April 21 - South from Bang Phra to Si Racha vegetation gets more luxuriant. Small hills are wooded but woods seem very degraded and showing evidence of shifting cultivation on slopes. In flat land ~~back~~ back of ~~coast~~ beach Manihot is extensively cultivated. Jak fruit trees common.

South of Si Racha wooded hills, flat land between them with much mango, Thyrsostachys, jak, bananas, tapioca. Shifting cultivation "lum toi" and tangled second growth on hills. Second growth called "~~Pa~~ rang" "pah rang". ~~Primary forest~~

From 6 (-10) km. north of ~~Sa~~ Bang Saray are scattered large Dipterocarpus trees on rolling land just back of coast and at a few m. elevation. These left from clearing of forest.

Miscellaneous cultivation and large patches of low secondary scrub. various ages. Coconuts. tapioca, rice, bananas jak, papol, mangoes, papaya. South of Bang Saray ~~Dipterocarpus~~ and dipterocarps ~~disappear~~. local. Coconuts most common. A very few Borassus.

Common roadside weeds are Imperata, Eupatorium odoratum, Tridax, Boerhaavia. locally ~~Ricinus~~ Jatropha gossypifolia.

Patya Bay

Low bluffs of Miocene overlying a coarse granite. Thickets of Xylocarpus, Clerodendrum inerme, Wedelia biflora, several shrubs.

Beach of light gray sand.

1950 Thailand

April 30 - Bangkok is characterized by ~~the~~ an abundance of canals, now mostly in disuse. These have a profusion of water plants, which are gathered and utilized to some extent for pig- and chicken-feed. The following were noticed, but the list is by no means exhaustive:

Eichhornia crassipes
Marsilea sp
Polygonum tomentosum
Nymphaea lotus
Nelumbo nucifera
Lemna sp.
Pistia stratiotes
Azolla sp.
Cyperus sp.
Commelina diffusa
Alternanthera repens
Victoria regia

Bangkok is not especially noted for its cultivated plants. Many of the common tropical ones are present, but one is not especially impressed by them. There ~~were~~ are prominent:

Delonix regia
Mangifera indica
Musa sp.
Cocos nucifera
Casuarina equisetifolia
Samanea saman
Hibiscus hybrids
Elaeocarpus sp.
Polyscias sp.

1956 Thailand

May 1 - Flight from Bangkok to Hong Kong

Rice fields east of Bangkok have mostly been plowed. Many small ponds scattered here and there, some obviously very temporary pools, some more established. Near Bangkok there are scattered dwellings surrounded by bamboo, Elaeocarpus, and other trees.

Further east there is a major pattern of canals running north and south at regular intervals, intersecting with one large one along exact course of plane. Fields are oriented perpendicular to these canals and all dwellings concentrated along canals. Most fields have been plowed, some are very wet.

Somewhat more to the east the canals become much less regular and seem, judging from oxbows, etc. to follow meanders of former streams to some extent. Here are a great many more ponds and in the

course 70°

general network of channels in the bottom-lands of the Bang Pa Kong river the regular rectangular pattern of the rice fields disappears. But it is still all rice cultivation.

Eastward of the river there seems to be no regular pattern. There are some long canals and a number of meandering water-courses, but the rice patches are not oriented in any regular manner. Villages are marked as patches of trees. Locally the rice seems submerged.

After some cloudiness the country is mountainous and forested, rather few clearings. Visibility poor. Then the course crosses a major escarpment, or rather follows just south of it, with a valley to the north with considerable clearing. Then the land becomes quite level, but almost entirely forested - a dense canopy characterized by abundant emergent trees. A single

1956 Thailand

winding red road connecting scattered clearings. Then some gently hilly land, hills apparently rather high, densely forested, abundant emergent trees.

Then a northeastward trending valley with considerable cleared land and a very different sort of forest, some apparently rather dry grassland along river (probably fallow rice land).

Partly of it a very level terrace, mostly forested with the same very even type of forest as in the upper part of the valley bottom, → completely without emergent trees. Then more meandering tributaries with broad belts of rice fields, now brown.

Then a large wooded plain, with, at first, some clearing and secondary forest, then solid forest, locally quite coarse textured, locally with emergents. Then rather large cleared areas, soil very red. Cleared areas irregular in outlining but

tending to follow drainage pattern to northward, evidently occupying the lowest parts of the very flat valley.

Then cloudiness becomes almost complete.

Glimpses of land through clouds, ~~of cloudy and mostly~~ ~~[illegible]~~ show forest with numerous clearings.

Visibility again good west of Lizabet in Nam Mun valley. Mostly cleared and intensively planted to rice.

Nam Si River, entering Nam Mun above Uben, shows amazing series of meanders and ox bows, some dry, some with water. Conspicuous sedduh tan sand bars being built on convex sides of meanders.

Country here, and especially just east of Uben is a curious pattern of green, apparently bush fallow, with brown rice fields. These with sparsely scattered trees. The green very much cut up into small patches, some cleared and

burned, some actually tree covered. An air strip trending n.e.-s.w. has evidently been rendered unfit for use by cross barriers and excavations.

Eastward the texture of this pattern becomes finer, the patches smaller, with less rice in proportion to shifting cultivation, then rice again predominates. At least there are small patches oriented like rice patches - no evidence of irrigation - system from this altitude. (15,000')

Scattered trees become more and more abundant, watercourses accompanied by strips of woods.

Then a patch of wooded country, possibly slightly hilly, clearly secondary woods.

Visibility becomes poor again. Crossed Mekong but could not see it.

10 minutes west of Tourane mountainous country, with rivers entrenched in V-shaped valleys, trending north. Ridges wooded, but with slopes cleared irregularly, mostly in scrubby second growth. Some patches of good forest on high slopes. Streams not muddy. A fairly large river running eastward, becomes muddy lower down, through forest becomes better, less cleared eastward, much less shifting cultivation and more continuous forest 5 minutes west of Tourane. Visibility poor. Some rice land in flat valley bottom. Poor second growth on slopes and ridges above this.

1956 South China Sea

At sea between Tomasse and North Reef, about 15-20 minutes out. Curious tan colored patches on sea, diffused in an elongate manner parallel with wind waves and forming long irregular streaks, as though either a spongy miscible silt or a surface foam were drifting along, rather irregularly arranged by wind. This appearance extends for miles to the northward in irregular bands, some sandy east and west also, but these cross banded ~~[illegible]~~ diagonal to principal swell pattern. At first sight appeared to be reflections of sun through holes in clouds, broken up by waves, but this incorrect, because the pattern is same viewed from any angle. No obvious explanation. Three principal areas observed, within about 6 minute flying time. Another shortly after.

Water generally blue, but not brightest blue, because of thin overcast. More in long

thin bands or streamers a little farther on.

Could be a plankton bloom.

Patches become much more abundant and denser about 6 minutes farther east, as though someone had spilled gigantic sacks of bran on the surface of the sea which had then been irregularly carried down-wind, almost like innumerable tiny smoke bombs.

Judging by color of water, the depth here is not great. A mottled rather light blue, with some patches quite light.

Surface phenomenon now very common, extending in streaks miles long, irregularly cross banded, more diffuse eastward, but if anything more abundant. Visible far to southward, too, as well as to north. Is undoubtedly something on surface, like foam. More and more abundant eastward. Then extremely abundant northward but no more to east as North Reef is approached.

North Reef is a perfect drowned atoll, with breakers all around except on west end. Lagoon in west end, about 2/3 as long as entire reef. Reef very broad, especially on east end. Only one very narrow channel, on s.w. corner, this not clear on inner end. Whole reef light green with brown patches and fine mottling. Lagoon with network of sand reefs. No dry land at all.

Very few strings or of discoloration on surface east of reef, much visible to south, along course which is now east and.

After a few minutes no more discoloration seen.

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a long island a two islands across mouth of harbor to east. These have little or no woody vegetation.

Approaching Hong Kong - many small rocky islands of all sizes. Smallest entirely bare rock, no vegetation or only grass. Larger ones with grass and small thickets. Conspicuous reddish intertidal zone, occasionally a very narrow reddish beach. On most islets little woody vegetation, much exposed rock. Mostly not inhabited, but a small city on one in entrance to bay.

Coastline very intricate, scarcely possible to distinguish larger mountainous islands from mainland. Mainland hills grassy, small patches of woods near to s., but very few. Many ridges bare and eroded, red.

Hong Kong Island more wooded

Hills back of Kowloon exceedingly eroded and bare.

Hongkong Island mainly grassy, but with low brush or bushy woods on steepest slopes and in ravines. A little terracing on slopes, but not much. Entire area very rugged.

May 15 - area between Naha and Kadena Air Base -

A disturbance complex on deeply weathered reddish soil derived from limestone, with limestone knobs, chimneys, and pinnacles cropping out here and there.

The vegetation is a mixture of patches of Miscanthus, Imperata, low mixed thicket, scattered trees and clumps of Pinus luchuensis, ferns and cycas revoluta. Exposures of limestone generally fern-covered.

Animals -
Lot 3. May 15,
land shell
Yaka, n.e. of Ishikawa
scrub-covered hills,
reddish soil

May 15 - Yaka, n.e. of Ishikawa

The hills here are covered with a degraded scrub mixed with Miscanthus sinensis on a sterile reddish soil with angular rock fragments.

Aristida, Dianella, Aletris, Spiranthes, Drosera, and Lindsaya, Gleichenia are common herbs, Schima, Symplocos, Vaccinium, Rhodomyrtus, etc. are common shrubs, with young Pinus luchuensis coming up everywhere in great abundance to 2 or 3 m. tall. This area has been forest mostly pine, till after the war. Then it was logged off completely.

At the top of the beach is a row of Pandanus - probably the P. tectorius var. liukiuensis of Walker's flora. It is certainly much like the slender plant of Ceylon, India, etc. in habit.

Cycas absent from this area.

May 15 - Area between Kin-son and Kochiya is limestone and generally cultivated. Cycas again noticed on scarps and outcrops.

Road across the island between Kochiya and Kobesoko - this area has also been cut over clean. It is ~~covered~~ a scrub mixed with Miscanthus and, at higher altitudes, with Pleioblastus linearis. The higher part of this road is called Meiji-yama. It is said that during the period of the Meiji emperor when much money was available for forestry, much camphor was planted here. The scrub is about 2 m. high. Rhus, Ardisia, Raphiolepis, etc. Small pines are scattered all through this.

animals -
Lot 4 May 15
Burma, s. shore of Motaba Peninsula
land shells in sand at top of beach, sub-fossil.

May 15 - Burma, on south shore of Motaba Peninsula
Sheet beach of pale fine sand (sample) At top of beach, thickets of Scaevola, both glabrous and densely pubescent forms growing side by side. On the sand are mats of Vigna - a smaller leafed plant than V. marina, much more compact, flowers perhaps larger. Ipomoea pes-caprae v. brasiliensis, Ixeris repens, Ipomoea sodiflora, Thuarea, etc. creeping on sand. Chenopodium acuminatum, erect, scattered among the prostrate plants.
Among the Scaevola is also Clerodendrum inerme and Pandanus.
The bluffs and foothills above the beach are of limestone. They are covered by a low scrub of Pandanus, Cycas, Ficus (F. gibbosa, F. retusa, F. wightiana), Psidium guajava, Berchemia lineata, a dwarf bamboo, etc. mixed with Miscanthus and small pines.

May 15 - Yaka, n.e. of Ishikawa, Kunigami-Gun
seashore

36969		Hedyotis (Edgeworthia) on hard gray shale (or schist) just above high tide level	1 m. ↓ prostrate, leaves fleshy; flowers white, throat closed by stiff hairs.
4	70	Euphorbia chamissonis Boiss.? on sand at top of beach	— almost prostrate lactiferous; leaves pale beneath sub-fleshy; glands of involucre greenish, pale.
3	71	Vitex rotundifolia on sand near top of beach	— prostrate, flowering branches ascending flowers light violet or bluish lavender.
2	72	Thuarea involuta (Forst.) R. & S. on sandy beach	— prostrate, rooting at nodes, flowering culms erect.
4	73	Ischiaemum liukiuensis Nakai sterile brushy hills overlooking beach, common.	5-15 m. ↓ large shrub; flowers white.
1	74	Selaginella Lutchuensis Hieron. shaded side of small ravine on sterile brushy hill overlooking beach	prostrate adhering to earth, very fragile.
3	75	Vaccinium on sterile brushy hills overlooking beach	small shrub, fruit dark red, immature; — said to be edible.
1	76	Spiranthes ~~Lucensis~~ rare on sterile brushy hill overlooking beach	roots fleshy.
1	77	Lindsaya orbiculata (Lam.) Mett. rare on sterile brushy hill overlooking beach	

1956 Ryukyus 7s.

Okinawa

36978 1 Rhodomyrtus tomentosa (Ait.) Hassk. common on sterile hills overlooking beach — shrub 0.5 m. tall, flowers rose-colored.

2 79 Psychotria serpens L. occasional on sterile hill overlooking beach — prostrate, branches ascending at tips, flowers greenish white.

May 15 - Meiji-yama, ridge in center of island s.e. of Kobezoku;

2 80 Gleichenia linearis var. fernginea (Bl.) v. A. v. R. abundant in low scrub with dwarf bamboo. — Kunigami-gun — forming tangles.

May 15 - Buma, on south shore of Motoba Peninsula west of Awa;

Kunigami-gun

2 81 ~~Lygisa~~ Lygodium serpyllifolia on sloping limestone rock — 5 m.

2 82 Ficus ~~gibbosa~~ F. virgata Reinw. on sloping limestone rock — 6 m. shrub; veins white; fruit orange-red, not mature; said to be edible.

3 83 Scaevola sericea Vahl on low bluff at top of beach (with 36984) — 3 m. hairy form - shrub 2 m. tall; flowers purplish.

3 84 Scaevola sericea Vahl on low bluff at top of beach (with 36983) — 2 m. glabrous form - shrub 2 m. tall, flowers purplish.

3 85 Wedelia biflora (L.) D.C. on low bluff at top of beach — 2 m. trailing herb, hanging down; flowers yellow.

1956 Ryukyu Is.

36986 Convolvulus soldanella L.
growing in sand
in upper part of beach

2 87 Chenopodium acuminatum
common at top of sandy beach

4 88 Vigna
common at top of sandy
beach

May 15 – Shiogawa (Suga)
on south west side of
Motobu Peninsula, south
of Sakimotobu; Kunigami-gun

3 89 Ruppia maritima L. (flower)
abundant in brackish
stream near mouth

May 15 – Shushi, on
north side of Motobu Peninsula
Nakajin Protected Forest
Nakajin-cho; Kunigami-gun
Broad leafed evergreen
forest

2 90 Lygodium
common around edges of

1 91 Acer oblongatum
common in

4 92 Phyllanthus rhamnoides
common in edges of

rhizome white, deeply
buried in sand,
flower pale lavender pink,
open in afternoon;
stigmas 2, elongate.
erect

prostrate, forming
mats 1 m. or so across;
flowers yellow,
keel ~~striate~~ not
twisted.

This is a brackish water, actively
flowing stream, lined with
Hibiscus tiliaceus, Clerodendrum
inerme, Murraya paniculata, Arundo donax.
caespitose, weeds,
trailing with current.
Det. C. den Hartog 1969

fronds twining, tangled,
terminal part fertile.
young tree, sterile;
leaves glaucous beneath.
shrub 2 m. tall, flowers
yellowish, fruit erect,
reddish.

3 6993 Asplitidia ~~ingens~~
common in shrub layer of

1 94 Randia
occasional in shrub layer of

3 95 Psychotria
occasional in shrub layer of

1 96 Carex

May 15 - Kami-motoguo, end of Motobu Peninsula.
Limestone bluffs here are covered with an almost pure stand of Cycas revoluta.

May 15 - Nakajin Protected Forest, Ishushi, Nakajin-cho.
A former shrine forest now preserved as a natural vegetation reserve.
This is a low thick forest up to 10-15 m. tall, part of it in a ~~ca~~ ravine, the trees crooked and gnarled, with a complete canopy, and a fairly thick shrub layer. The walls of the ravine are of rough limestone.

weak shrub 2 m. tall; flowers white, hairy.
- shrub 2 m. tall, flowers white; stigma strongly exserted, narrowly bifurcate.
- shrub 2 m. tall; flowers greenish.

The tree layer has Ficus, Fraxinus, Lapindus, Diospyros, Naucleа, etc. The shrub layer has various Rubiaceae, arenga, Eleagnus, Acer, Calophyllum, etc. Herb layer of ferns. Bracyia rhachnoides around edges.
Arenga here is definitely caulescent. The trunk of one examined was about 1.5 m. high, the top part covered by leaf bases, the bare part perhaps 6 cm. thick. Most of the plants have much shorter trunks, completely covered by leaf bases. Pinnae scarcely or not articulate, fiber soft, cloth-like.

1956 Ryukyu Is.

May 15 - Mts. south of Nakasoni

The higher parts of these hills, above the limestone, are covered with a vegetation predominantly of Gleichenia linearis, a thick blanket of it, with scattered Schizaea and Pinus (small).

May 15 - beginning about 1 mi. south of Nago there is a broad reef flat cut into a coastline of shale and limestone. At the shoreward side of this are frequent stretches of beach-rock. They occur south to at least even with Kadena.

May 16 - South of Shuri and east of Naha the hills are covered by an almost pure stand of Miscanthus. Before the war this was pine forest.

No cycads seen in this area.

May 16 - south point of island, south of Kiyan.

This is an area of "natural" grassland lying on a small rather rough plateau of limestone with pockets and small patches of chocolate-brown soil. Where the soil is thick there are patches of sweet potatoes, sugar cane, and other garden crops. Other parts, forming rather a "matrix" are grass-covered with principally Miscanthus, probably M. sinensis, but with some ? Imperata. On actual outcroppings of rough limestone the Miscanthus is mixed with scrub.

This scrub is composed of Pandanus sp., Toddalia asiatica, Wikstroemia, Cycas, Ficus, "Breynia", Alpinia speciosa, Berchemia, Maytenus (?), tangled with Canavalia and Rhynchosia, with some Dianella and much Ligularia. Near the edge of the cliff in the vicinity of the beach Cycas is very abundant, only occasional farther inland.

Viburnum, Pittosporum,

The Pandanus here is small and rather scrubby, slender, and shows two principal types, both somewhat variable. One has the leaf spines rather long and strongly divergent (though on the same leaf this may vary a great deal) and widely spaced, and has the phalanges somewhat flat topped, the carpels scarcely separated at the top. The other form has the spines smaller,

more appressed, and the carpels separated more or less conspicuously at the tops. The fruiting heads of both types are about 15 cm. or less in diameter and spherical. The long-spined type is very much like the one in Ceylon, India, Maldives, etc. The other seems to be a form of P. tectorius. The two grow together and are not well separated.

The Miscanthus on Okinawa is quite variable, but certainly does not seem to be sharply separable into two species. One sort is broad-leafed and robust, the peduncles stout and tall. The other extreme has narrow flexible leaves, more slender culms and peduncles. However, there is no apparent sharp difference or boundary between them, either morphologically or geographically or ecologically.

May 16 - hills south of Ozato, south end of island.

On the broad limestone ridge south of Ozato is a large area of luxuriant Miscanthus with isolated shrubs and patches of scrub on limestone outcrops. The soil is a chocolate brown in color. Where it is thick are small patches of cultivation. Small holes have been dug scattered over the area, said to be from attempts to find old shells for scrap metal.

The scrub on the rough limestone is composed of Viburnum, Cinnamomum, Macaranga, Mallotus, Toddalia, Pittosporum, Cycas, Dianella, Pandanus, etc. liberally mixed with Miscanthus. This area is fairly extensive. It does not seem to have been burned for several years, as there are scattered small pines.

May 16 - Southern Okinawa.

The whole area is a complex of patches of cultivation interspersed with grass and scrub. The principal cultivated crops are sweet potatoes, soy beans, sugar cane, a little rice in low places, a little maize, a few cabbages, etc.

The grass is on thin soil, slopes that are relatively steep, and on areas that are out of cultivation for military reasons. Scrub is generally on limestone outcrops. Cycads are fairly general on limestone but rare in center of island, commoner toward coast, abundant on actual coastal cliffs and bluffs. Pines become rare southward but are generally present except where there have been recent fires. They are absent in area just south of Ishii. Casuarina occasional southward, small.

1956 ~~Okinawa~~ Ryukyu Is.

May 18 - Kadena Air Base housing area.
Small hills of limestone here with pine forest on them - the pines 10-20 cm. diam. and 5-8 m. tall, rather flat-topped.
No underbrush but a complete ground cover of vines.

May 16 - hills south of Ozato; Shimajiri-gun on rough limestone outcrops in Miscanthus grassland.

36997 Nephrolepis cordifolia (L.) Pres
4 common in scrub

1 98 Carmona retusa (Vahl) Masam. Ehretia
rare in scrub

5 99 Mallotus japonicus M.-A.
occasional in scrub

37000 Croton cumingii M.-A.
2 occasional in scrub

1 01 Ficus erecta var. beecheyana (H. & A.)
rare in scrub

02 Cinnamomum japonicum Sieb. ex Nees
occasional in scrub

4 03 Pittosporum tobira (Willd.) Ait.
occasional in scrub

3 04 Viburnum suspensum Lindl.
common

fronds erect

flower white

shrub 2 m. tall

~~shrub~~ low shrub

shrub 0.5 m. tall, fruit green with red ripe.

shrub 2 m. tall, somewhat aromatic.

shrub 1 m. tall, fruit smooth, immature.

shrub 1 m. tall, berries juicy, scarlet

Mayio - south end of island, south of Kiyan; On limestone soil with outcrops of rock

3 7 0 5 / 4		Rhynchosia volubilis Lour. ? common	extensive twiner, flowers yellow.
1	06	~~Celastrus~~ Celastrus very common on rocks	semi-prostrate, flowers yellowish, fruit pinkish.
3	07	Solidago occasional in scrub	flowers bright yellow.
3	08	Peperomia pocket in rough limestone	leaves and stems, and spikes fleshy
2	09	Ledum common on rough limestone	~~common~~ leaves fleshy.
7	10	Emilia sonchifolia (L.) DC. common weed in sweet potato patch	flowers bright rose pink, somewhat exserted.
2	11	Smilax sebeana Maq. det. T. Kojima 1959 occasional	climber; fruit immature.
4	12	Rhamnus occasional	shrub; fruit immature
2	13	Ficus retusa var. nitida Thunb. common	prostrate shrub
2	14	Pittosporum tobira (Willd.) Ait. rare	shrub, fruit immature
4	15	Ligustrum common	shrub
1	16	~~Capparis bodinieri Levl.~~ Paramignya scandens Hl. rare	twiner; flowers greenish yellow.
1	17	Cocculus trilobus (Thunb.) DC. rare	twiner; flowers whitish.
2	18	Sida "rhombifolia" occasional	prostrate; flowers orange.

3	7	Canavalia microcarpa	twining over ground
7	19	common on bare ground	and weedy; flowers rose pink
5	20	Wedelia (Sinuana (Collect.)) Mor.	flowers bright yellow.
		common in open grassy	
		ground	
3	21	Viburnum odoratissimum K. Koch	small tree 3 m. tall
		occasional	fruit scarlet, not
			quite mature.

May 19 - Between Awase Meadows and Awase Airfield.
Hills of a very stiff gray clay, rather bedded and greatly shattered, simulating a shale but very soft.
The vegetation here resembles that on limestone, with Miscanthus and Cycas very prominent.

1	22	Galium	; Nabaganne-gusa
		common on overhanging	stems weak, pendent.
		bank.	

May 19 - North of Enoki
top of low ridge of deeply weathered mica-schist, the soil strongly lateized.
The vegetation here is very much degraded, reduced to a mixture of depauperate Miscanthus, Gahnia, Gleichenia linearis, Aristida, Vaccinium, Lycopodium cernuum, Osbeckia(?), Dianella, Paspalum, Solidago, Schima, Cassytha, Pteridium, Rhodomyrtus, Cassytha, and scattered small pines. A few other broad-leaf shrubs also common. The relative abundance of the principal plants observed

1956 Ryukyus.

is as follows:

a Vaccinium
a Gleichenia linearis
f Miscanthus
f Pinus luchuensis
f Gahnia
f Aristida
c Lycopodium cernuum
c Osbeckia?
c Paspalum
c Ischima
c Dianella
o Rhodomyrtus tomentosus
o Solidago
o Cassytha filiformis
o Pteridium aquilinum

The pines are scattered, very small, 1-3 m. tall, upto 6 cm. d.b.h usually smaller.

May 19 - ~~Oct 20~~ North of Enobi; Nakagami-gun on top of sterile ridge on hard reddish soil, depauperate vegetation.

37023 Paspalum orbiculare G. Forst.
2 local in muddy spots

2 24 Fimbristylis Thomsonii Boeck. det J.H. Kern
local in and around muddy spots

1 25 Pogonatherum ~~crinitum~~ (Thunb.) Kunth
very local on slope.

On the sides of the ridge pines are more abundant and reach a somewhat larger size. The Miscanthus is more abundant and large, as are Ischima and other shrubs.

There are also many more species of plants on these slopes than on the ridge.

This is representative of fairly large areas in this vicinity. In places the grass is more prominent and the pines smaller and less abundant.

24 - Ischaemum

scattered culms a very loosely caespitose. very small tufts, culms ascending to spreading.

det H. Ohba

May 19 - in general area between Iha and Nakadomari, and isthmus to north and hills to south are fairly large areas of hilly land covered by low sparse Miscanthus with Vaccinium, Gleichenia, small pine seedlings, etc., on a red lateritic soil.

Animals. Lot 5 May 19
Bolo Point
land shells, living and sub-fossil, in pockets in high pitted limestone rocks at top of cliff.

(3786 a Euodia ramiflora Dc.)

May 19 - Bolo Point; Nakagami - on and around jagged rough limestone

3786 Berchemia
6 abundant locally

1 4 27 Ischaemum
very local on vertical surface

4 28 Phyllanthus?
common

May 19 - Bolo Point - this is a slightly rolling area, largely covered by grass - Miscanthus and Imperata. Around the edges are the remnants of a rim of very rough pitted limestone. On this is a scrub of Pandanus, Toddalia and a number of other shrubs, & on the steeper and more jagged surfaces, a scattered vegetation of Ledum, Peperomia, Portulaca obinawensis, Hedyotis sp., Ischaemum, and several other small herbs, and Berchemia and Paederia. The rock surface is almost honey-combed. Land snails are abundant.

intricately branching prostrate shrub, close to limestone surface. caespitose.

low shrub 3-4 dm. tall, branched at base; flowers white, fragrant.

3	7029	Hedyotis in crevices and pits on vertical surface	prostrate; leaves fleshy; flowers white.
2	30	Ischaemum in depression in soil back from rim.	
2	31	~~Fasciculus~~ in pits on vertical surface	prostrate, leaves green above, pale beneath, corollas violet.
1	32	Portulaca okinawensis in pits on vertical surface	prostrate, fleshy; roots thick and rather tuberous; leaves alternate, oblong; flowers bright yellow within, orange without, stamens 20 or more. — depressed shrub, — short branches erect. flowers magenta.
3	33	Bochmeria nivea local	
1	34	Ipomoea littoralis common	
		May 19 — Bolo Point Beach, southwest of Mazuya — Kunigami-Gun	
3	35	on sand ridges back of beach. Wedelia occasional	prostrate, fleshy.
5	36	Glehnia common	decumbent; fleshy; flowers white, fruit fleshy "shi'i bohu" a "shiba" said to be used for a tea to treat colds or coughs. — leaves, said to be used crushed as poultice for sores.
1	37	Plantago major L. roadside	

May 19 - Bolo Point Beach
Ridges of lime-sand back of beach 1-2 m. high. The sand is being excavated and hauled away by truck. Also sweet potatoes are planted in some of the ridges.

Vitex rotundifolia forms mats on some of the ridges, also Ipomoea pes-caprae, ~~and~~ Wedelia. ~~Ixe~~ Ixeris repens forms extensive underground systems of stolons, as does Convolvulus soldanella. A grass, like Sporobolus virginicus, is abundant in places. A very large grass, probably Spinifex littoreus, is local and very extensively creeping. Glehnia is common, very deeply rooted.

May 21 - directly west of Okinawa are two small flat islets and a sand bar. The islets are green but can't make out any detail. Southwest of these are several high islands.

Southwest of Okinawa a short distance is a tiny circular reef with a depression in center, most of reef shows some dry land at low tide, a small islet on north side, with beacon or marker. Apparently always emerged, no vegetation apparent.

May 22 - ~~1 mile n. of Moriyama~~ 2 km. s. of Ozato — 60 m.
thin grassland

37038 Uraria crinita Desv.
common locally in

~~spadix~~ racemes erect, flowers bright rose pink

May 22 - ~~1½ mile n. of Moriyama~~ just n. of Nusukun-mura, 1.4 km. s.w. of Ozato

39 Blyxa ~~japonica (Hook.f.) Nakai~~ aubertii Rich.
growing submerged, rooted in mud in paddy field.

det. C. den Hartog 1969 (fruit)

flowering scape erect flowers emerged purple.

May 22 - ~~1 mile 10° w of n. of Moriyama~~ 2 km. s.s.w. of Ozato — 80 m.
s of Nusukun-mura
thin grassland

40 Emilia sonchifolia (L.) DC.
in disturbed grassland (forest plantation failure)

flowers purplish, slightly exceeding involucre.

41 Wahlenbergia ~~gracilis (Forst.f.) A.DC.~~ marginata (Thunb.) A.DC.
occasional in

flowers blue

42 Emilia sonchifolia (L.) DC.
rare on eroded rocky place in

flowers pinkish purple, somewhat exceeding involucre

43 ~~(=41)~~
rare on eroded rocky ground

flowers purplish pink, lip deep maroon purple. heads whitish green.

44 Cyperus (Kyllinga)
rare on steep slope in

heads green.

45 Cyperus (Kyllinga) brevifolia
rare on steep slope in

flowers purplish pink, 2 large stamens with blue anthers, one slender staminode, 3 small stamens with yellowish deeply lobed anthers.

46 Aneilema
rare on steep slope in

37047		Paspalum orbiculare G. Forst. common in	
1	48	~~Boerhavia~~ rare in	
5	49	Blumea common in I. Kamiura 1958 0.5 km. s. of Musukuru-Mura May 22 - ~~0.7 mi.~~ 2.3 km. s.w. of Ozato ~~from Moriyama~~ open stony grassland	50 m.
5	50	Helicteres angustifolia common in	
5	51	Rosa common in	
3	52	Eurya common near edge of ravine in	
1	53	Cassia ~~mimosoides~~ rare in	
2	54	Fimbristylis rare in	
1	55	~~Boerhavia~~ rare in	
5	56	~~Andropogon~~ common, locally dominant in	
2	57	Sorghastrum rare in	
1	58	Blumea rare in	
1	59	~~Melastoma~~ Melastoma candida var. mollaan (Bl.) occasional in	

slightly tufted.
corolla ~~flowers~~ white, calyx green.
erect, disk yellow

spreading to ascending from root crown: corolla lavender.
procumbent shrub, flowers white.
erect shrub 2 m. tall, (mostly lower), fruit green.
flowers yellow

culms ascending
corolla ~~flowers~~ white. calyx purplish.
tufted, erect.

erect

erect, disk yellow.

flowers rose pink

1956 Ryukyus Is.

May 22 0.5 km. s. of Nusukusu-Mura
~~0.2 km. s.w. of Oyado~~
1.3 km. s.s.w. of Oyado

~~On~~ on large limestone boulders or remnants

3	70	60	Galium locally common
2		61	(~~Not det.~~) locally common
3		62	Phaseolus common
5		63	ampelopsis brevipedunculata common
1		64	Polypodium scolopendria Burm.f. locally common
1		65	Vernonia rare
2		66	Callicarpa local
1		67	Emilia sonchifolia (L.) DC. rare
2		68	Leucas occasional
1		69	Cyperus occasional around base of boulders
5		70	Pittosporum tobira (Wild.) ait. common
3		71	Lygodium common rooted in ground, climbing on boulders

50 m scattered in grassland.

prostate to pendent, roots yellow, flowers green.

— scrambling; flowers yellowish.

— twining; flowers yellow, keel twisted.

— climbing vine, flowers yellowish green, fruits immature.

— rhizome bluish green.

— sub-shrub; flowers pale lavender

— flowers purplish, somewhat exceeding involucre.

— flowers white.

shrub 1.5 m. tall, fruit immature (two actual plants represented)

3,7074 Nephrolepis hirsutula (Forst.) Presl
1 occasional

1 73 Cayratia retusa
occasional

2 74 Oxalis corniculata L.
common in pits and crevices

5 75 Dianella ensifolia (L.) DC.
common

May 22 – 1 mi. 16° w. of n. of Moriyama (1, 2, 3 on photo 945-16)

(1) Short, rather sparse grass on gentle slope extending out from foot of small but steep hill. The ground is only thinly covered. Imperata, up to knee high, is dominant, mostly not so tall. There is generally a strong admixture of Lygodium, the fronds only 1-3 dm. long. Locally young plants of a fern (probably a species of Thelypteris) are common to abundant generally. There is some Lespedeza cuneata and a very little Blumea. Locally Pteridium and Gleichenia

shrub 1 m. tall, rarely fruiting, fruit immature.
— depressed shrub, fruit red when ripe.
— flowers yellow.

flowers sky blue, fruits bright dark purplish blue when ripe.

form patches (separately), some rather large. Small shrubs or sprouts are scattered generally, especially Osbeckia.
Pits a "foxhole" are scattered here and there – from the war. These are characterized by Blechnum orientale, Ficus, Osbeckia, Gleichenia, etc.
This area has probably been burned in relatively recent time, though no very obvious evidence remains. The grass is thinner than usual for Imperata. Some ground is to be seen between the tufts of grass and other plants.

1956 Ryukyus Is.

(1) plants observed:
Imperata
Rubus
Rosa
Thelypteris
Lygodium
Paspalum orbiculatum
Psidium guajava
Centella asiatica
Lactuca sp.
Lespedeza cuneata
Desmodium sp.
Chrysopogon aciculatum
Smilax
Osbeckia
Lcleria
Blumea
Pteridium
Gleichenia
Oxalis

(2) On steep slopes a tall dense stand of Imperata has been grubbed out in rows and left in rows, about 1-1.5 m. apart. The part left is dense and about 0.75 m. tall. In the cleared strips pine seedlings have been planted, or on bare slopes, Acacia confusa and Casuarina. The pines have mostly died. The Imperata is coming back here, along with Lygodium, Lcleria, and many other weeds. This slope may not have been burned as recently as some of the others.

(3) A gentle slope at the foot of (2) is a mixture of Imperata, Andropogon, Lcleria, etc. with scattered small pine trees and with a rather thriving plantation of small Casuarina and acacia saplings.

May 22 - 0.8 mi. 32° w. of n. of Moriyama

(4) (Photo 945-16)

Gently sloping terrace of stony soil, in places, at least a gravelly clay. On the surface are scattered a few huge limestone boulders and remnants. This limestone is a very rough pitted reef limestone.

The vegetation is a thin grassland of Imperata with some Andropogon, Scleria, Fimbristylis, Cyperus, Rhynchospora rubra, Setaria, with scattered subshrubs of Osbeckia, Rubus, ~~the~~ Helicteres ~~(vine, Lythraceous) plant~~, Rosa, etc. apparently sprouting from rootstocks after burning. Herbs such as Blumea, Centella, Lespedeza cuneata, Cassia, and especially Lygodium scattered through the grass. On small escarpments and ravine walls Andropogon is most important grass. Locally a few bushes of Eurya.

much bare earth visible.

Ravine bottoms are wet and mostly occupied by small paddy patches.

Here are various other species of marsh plants and weeds.

The limestone boulders mostly lie on a surface of schist or gravelly clay. The limestone had a very different vegetation, mostly shrubby. Three such boulders or remnants were examined. The following plants occurred there, numbers indicating how many of the boulders each plant was seen on.

Premna obtusifolia	3
Pittosporum tobira	3
Ampelopsis	2
Clematis	1
Oxalis corniculata	3
Ficus (at least 4 spp.)	3
Bochmeria nivea	3
Morus sp.	3
Rubus sp.	3
Dianella ensifolia	3
Gynura	2
Wikstroemia	3
Hedyotis?	2
Callicarpa	2
Bauhinia	1
Polypodium	1
Arenga	2
Leucas	2

Phyllanthus sp.	1
Carmona retusa	2
Artemisia	1
Lilium longiflorum	1
~~Cordia~~ ? Cirsium	2
Phaseolus	1
(Melast.)	1
Rosa	1
Paederia	1
Eupatorium	1
Thelypteris	1
Torilis	1
Galium	1
Miscanthus	+

Numbers 1-4 are indicated on photo 945-16.

May 23 - 1 km. n.w. of mouth of Todoroki-gawa

(5) (photo 940-48) Low rolling hilly of schist a gravel with schist boulders and a few limestone boulders in surface. soil very stony. The better spots are cultivated, mostly in sweet potatoes. The ravine bottoms mostly wet and in small paddy fields.

This is a thin grassland with much bare earth visible. Imperata is a minor component, with Andropogon (2 sp.) and Lygodium dominant, subshrubs of Psidium, Rosa, Rubus, etc. common. These are apparently root sprouts from burned off plants. The grass is thinnest on stony hill-tops, most luxuriant in hollows. Here, if it is wet, are many additional species. There are patches where Imperata is more common than generally. Limestone boulders have a shrubby vegetation.

1956 Ryukyu Is

Plants seen in grassland with their relative abundance:

a Andropogon (2 spp.)
a Lygodium
f Chrysopogon aciculatum
f Rosa
f Psidium guajava
c Blumea
c Artemisia ~~spp.~~
c Lespedeza cuneata
c Centella asiatica
cc Imperata cylindrica
cc Vernonia
o Rubus
o Lilium longiflorum
l small ~~labiate~~ acanth.
o Evolvulus
o Setaria
o Paspalum
o Uraria
l Fimbristylis (monost.?)
r Fimbristylis dichotoma
r Cassia mimosoides
r Cyperus (Kyllinga) sp.
r Cyperus cyperinus?
r Scleria
r Wahlenbergia

May 24 1.2 km; 30° w. of n. of mouth (C) (photo 940-48) of Todoroki-gawa

Essentially similar situation to (5), lacking limestone, schist actually exposed on some hilltops.

Vegetation similar, perhaps Imperata generally more important. Local differences in relative abundance of plants. Evolvulus frequent. Helicteres ~~Lophococcus (?) subobtusa~~, Hydrocotyle sp., Lactuca sp.,

same

(7) (photo 940-48)

~~Rock~~ Rough knobs of schist, with a few tiny remnants of very rough limestone on top.

Shrubby vegetation scarcely developed, but a few dwarfed Premna, Ficus (2 spp.), Psidium, Carmona, Morus, etc. with tufts of Miscanthus and Dichanth. Some Paederia, Phaseolus, Artemisia common. Lida, Rosa, Pueraria Vernonia, Rubus, Lygodium.

1956 Ryukyus)s

May 24 1.8 km. n. of Moriyama, s. of Ozata

(8)(photo 945-14)

gravel terrace with some large schist boulders. Dendritically dissected, the ravines with rice patches, but in upper reaches and small branches where the ravine is narrow and walls steep, they are filled with a mixed scrubby forest with Ficus, Macaranga, Rhus?, Arenga, Pandanus, angiopteris, and various other shrubs and small trees.

The flat tops and steep sides of the terraces are mainly Imperata but with some other plants. Rather sparse with some soil showing.

May 24 ~~1.8~~ 1.5 km. n. of Moriyama s. of Ozata

(9)(photo 945-14)

steep hilly with Imperata cut into strips and pine planted but not thriving, as in (7)(May 22, p. 115)

May 24 ~~1.9~~ 2 km. 20° w. of n. of Moriyama, s. of Ozata

(10)(photo 940-48)

rolling plain of rough limestone "pen"

grassland somewhat grazed.

Characterized by Imperata in form of discrete bunches about 0.6 - 0.8 m. tall, not flowering, but each bunch sheltering several culms of Paspalum orbiculare making it appear that the bunches are of Paspalum. The bunches are up to 2 m. apart or even more, usually 0.3 - 1 m. Often they are compound bunches, Imperata + Psidium, or Imperata + Rosa, or Imperata + Psidium + Rosa. Rosa and Psidium are very

1956 Ryukyus Is.

Frequent. Between the branches is a low sod-like ground cover of mixed herbs, prostrate Rosa, and grazed down grasses, with scab-like patches of rough limestone. The plants observed were:

Heavy soil.

a Imperata cylindrica
a Psidium guajava
a Rosa
a Hydrocotyle
c Wikstroemia
Verbena
Paspalum orbiculare
Paspalum scrobiculatum?
Galium
Wahlenbergia
Setaria
Stachys
Chrysopogon
Rubus
Fimbristylis ? spp.
Plectranthus?
r Vernonia
c Centella asiatica
o Digitaria chinensis
o Lida
o Oxalis corniculata
r Cassnna retusa
Lippia nodiflora
~~Labiate~~ acanth.
Phaseolus

Bochmeria
~~Cordia~~? Cissus
Digitaria henryi
Blumea
Torenia
Lilium longiflorum
Torilis
~~Coco~~ Apium?
Eupatorium?
Ampelopsis

A small sink hole is choked with Pandanus and some Macaranga, Morus, Alpinia speciosa, Toddalia, Bochmeria, Ampelopsis, Psidium, Ficus, Smilax, and a few other shrubs + vines, + ferns.

The Pandanus is exactly it habit that of Ceylon. When really ripe the fleshy part is swollen and pushes the keys apart. Largest head about 15 x 22 cm. Spines more slender + appressed.

Nearby lying on the limestone plain is a schist boulder about the size of a jeep. It is worn and rounded.

(11) (Photo 940-48)
small round hole in schist - like a bomb crater. Water in bottom with grass. little woody vegetation.

12 (Photo 940-48)
Imperata grassland with, on one rolling hill abundant discrete bunches of Andropogon. Other similar hill adjacent is Imperata without Andropogon.

May 24 0.5 km. n. of mouth of Todoroki-gawa
(17) (Photo 940-48 and 940-22)
remnants of rough limestone on reef flat. Undercut, very deeply pitted.
Vegetation low, nestling in pits, nothing over about 0.5 m. tall!
Composition:

a Zoysia tenuifolia
a Pemphis acidula
a Ischaemum
a Hedyotis albido-punctata
c Lysimachia mauritiana
f. Crinum
l Messerschmidia argentea
c Angelica
o Lepturus repens
r Pilea
o Vitex

May 24 - 1.2 km. 30° w. of n. of mouth of Todoroki-gawa 50 m.

(6) short sparse grass on rolling hills

3	76	~~[illegible]~~: roadside ditch	weak herb, scrambling in other vegetation
5	77	Rubus common on roadside banks (and on rock outcrops and generally in grassland).	procumbent, branches ascending; fruit red, juicy good flavor; receptacle conical, orange.
5	78	Osbeckia chinensis ~~common~~ Roadside banks (common generally)	shrub up to 0.8 m. tall; flowers bright rose purple.
2	79	Thelypteris goggilodus common in wet spot in hollow, growing in mud	rhizome creeping, fronds erect, all sterile.
3	80	Polypodium common in wet spot in hollow, growing in mud.	rhizome creeping, fronds strictly erect.
5	81	Paspalum common in small weedy abandoned cultivated patch	culms spreading
4	82	Centella asiatica (L.) Urb. common in small weedy ~~abandoned~~ cultivated patch	prostrate, rhizomes superficial.
1	83	~~Eragrostis~~ rare in disturbed ground in weedy abandoned cultivated patch	flowers white
1	84	Digitaria ~~ciliaris~~ occasional in weedy abandoned cultivated patch	culms spreading
2	85	Setaria occasional in weedy abandoned cultivated patch	

1	37086	Cyperus rare in weedy abandoned cultivated patch	
5	87	Gynura common in weedy abandoned cultivated patch.	→ Crassocephalum crepidioides (Benth.) S. Moore (U. P. O. Beddome) erect, heads nodding, dark richred.
5	88	Sida common in weedy abandoned cultivated patch	prostrate, flowers orange.
5	89	Evolvulus common generally on stony slopes	prostrate; flowers blue-violet.
1	90	Lactuca occasional on stony slopes	erect. flowers pale yellowish-white.
5	91	Wahlenbergia common generally on stony slopes	erect flowers blue-violet.

May 24 2 km. 70° w. of n. of mouth of Todoroki-gawa

		(10) rough coral plain, ~~pitted~~ heavy soil in pits,	30 m. with bunch grass (Imperata)
1	92	Vernonia cinerea (L.) less. occasional ~~in~~	flowers purple
1	93	Paspalum occasional	
1	94	Galium occasional on rough rock	flowers greenish
2	95	~~Stachys~~ occasional	flowers rose pink
1	96	Paspalum common, in bunches of Imperata	erect

37097 Fimbristylis
common in heavy soil — tufted

1 98 Torilis
occasional — flowers white

1 99 Tr
occasional

37100 ~~Colem~~
occasional — erect aromatic herb
— corollas blue-violet.
— flowers purplish.

1 01 ~~Tacca~~
rare in heavy soil

~~5 02 Pandanus tectorius fruit~~

5 02 Hydrocotyle
common in heavy soil — stem prostrate,
— branches erect.

5 03 Dioscorea
in sink hole — vine, twining on
— other vegetation.

5 04 Pandanus tectorius fruit
abundant in sink-hole — low twisty tree,
fruit ~~5~~ 15 by 20 cm.,
at maturity the pulpy
bases of keys greatly
swollen, separating
the apical hard parts.

May 24 east coast,
0.5 km. n. of mouth of Todoroki Gawa

(13) ~~(17)~~ 4-5 m
on pitted top of undercut remnant
of limestone platform
about 4-5 m above present
reef flat on which it stands.

05 Messerschmidia argentea (L.f.) Johnst.
common — depressed shrub, 0.5 m.
tall; leaves fleshy,
frosty appearing;
flowers white.

37106 Hedyotis
5 abundant ~~in~~ on
pitted surface

5 07 Pemphis acidula Forst. Bhsn.
abundant

2 08 Zoysia tenuifolia Willd.
abundant

5 09 Lysimachia mauritiana Lam.
common

5 10 Lepturus repens var.
common

5 11 Ischaemum
abundant

1 12 Limnium arbusculum (Max.) Muk.
local on most exposed
pitted surfaces

2 13 Pilea
local in pits

3 14 Crinum asiaticum
common on landward
side, ~~in~~ slightly
sheltered from spray.

May 25 - same

15 ~~sides~~ ~~Crinum~~.
undercut sides of small eroded
6 remnants of ~~reef~~ reef
rock and beach rock on
reef at or near high tide
level.

leaves fleshy;
flowers white

prostrate shrub;
flowers white
tufted; all seen sterile.

leaves fleshy, flowers
white, fruits reddish.
erect

stems prostrate,
tips ascending.
cushion plant,
leaves sub-fleshy;
all seen sterile.
stems fleshy, soft.

rosette plant,
neck up to 20 cm or
more tall, thickest
at base somewhat
contracted upward.

forming dense mats,
leaves fleshy; flowers
rose purple, stamens
opposite perianth parts,
ovary with 2 stigmas,
one seed, surrounded
at maturity by enlarged
fleshy disk.

1956 Ryukyu Is.
east coast
May 25 - 0.5 km. s. of mouth of Todoroki + Gawa

(14)
on slightly elevated shore line with beach ridge and low pitted limestone bluffs and platform

3 7 11 6 Spinifex
sandy beach

5 17 Phaseolus
sand on pitted limestone

8 18 Euphorbia chamissonis
seaward ~~slopes~~ sandy beach ridge, very common.

1 19 Ixeris
locally common on seaward slopes of sandy beach ridge.

5 20 Cirsium brevicaule var.
common in sand

5 21 Ixeris repens A. Gray
common on seaward slopes of beach ridges and on upper part of beach

1 22 Cosmopus wrightii Hara
very rare on pitted limestone cliffs.

3 m. prostrate, extensive, forming large loose mats.
4 m. — prostrate, extensive from deep root crown; flowers yellow, keel twisted.
4 m. stems spreading, slightly ascending, laciferous; leaves pale beneath; involucre glands narrow, yellow-green.
3 m. — rhizome buried in sand; flowers yellow.
4 m. flowers purple.
3 m. extensively creeping by long white succulent underground rhizome; flowers yellow. leaf blades and flower scapes only above sand surface.
4 m. — flowers white.

1956 Ryukyu Is.

37123 Indigofera linnaeensis Mak. abundant on pitted limestone

5 24 Zoysia matrella (L.) Merr. abundant on pitted limestone back from shore

1 45 Alysicarpus vaginalis (L.) DC. rare on pitted limestone

1 26 Fimbristylis cymosa rare on pitted limestone

May 25 - YCAT Compound 3 k/m. w.n.w. of center of Ishigaki City In grassy area or "lawn" around buildings

1 27 Setaria

1 28 Panicum

1 29 Digitaria

1 30 Sporobolus

1 31 Digitaria

May 25 east coast 0.5 km. n. of mouth of Todoroki-gawa

(13) Reef flat strewn with boulders, ~~tooth~~ mostly pitted limestone, some very large, some schist. Remnants of at least two older reef surfaces a planation surfaces a platforms represented, one by the 3 undercut remnants

4 m. ↓ prostrate; flowers red.

prostrate

rhizomes deeply buried.

culms spreading from root crown.

~~previously described~~ previously, at 4-5 m. above present reef flat, rough and uneven on top, strongly undercut on all sides, ~~one~~ and by low bluffs on shore, mostly covered by beach ridge; another by a platform at 1-1.5 m. very flat-topped. A remnant, possibly of this, but with ancient beach-rock on top, at 1.5-2 m., undercut.

1950 Ryukyus

sample later taken of this beachrock by Helen Foster to have thin section made for examination of aragonite cement. Around undercut edges of this, under overhang, is a strange Mesembraceous plant, fleshy, densely matted & in cushions, apparently covered by highest tides. Another sterile dwarf shrub (37112) with it. Present reef flat represents third surface. On this are curious flat-bottomed rimmed basins, the bottoms of hard limestone with somewhat abraded surface, the rims, 3-6 cm. high, are of sandy limestone resembling beach-rock. These are common about midway between shore and the 3 large erosion remnants mentioned above. General surface, otherwise very flat, except for occasional depressions. Many long & short cracks in reef flat, but these are rather irregular, rather than the straight or arcuate ones on atoll reefs

May 25 — east coast, 0.5 km. S. of mouth of Todoroki-gawa. (14) (photo 940.22)

Coast line of low pitted, often undercut limestone cliffs, 3-5 m. high, in places covered by a sand ridge. The cliffs where they are undercut is unusually abraded out, with many rounded boulders accumulated in recesses. At its base is a rather smooth, erosion ramp a few m. wide grading insensibly into the broad reef flat. On the flat are numerous boulders of limestone, of all sizes, very rough, sharp, and pitted, mostly concentrated near shore, scarcely any near reef margin. Reef flat very wide.

Cliffs with Hedyotis abundant in pits, also a few other plants. On top, where surface is exposed, ~~it is~~ rough and pitted, Zoysia tenuifolia is very abundant but does not completely cover ~~the~~ rocks. Back 30 or more

m. this is replaced by Zoysia matrella. Scaevola and Messerschmidia are scattered over this, in places forming a closed scrub. In open places Indigofera linkiensis is abundant, as well as prostrate Pemphis acidula. Back from the edge Pandanus makes up much of the scrub.

May 26 - north side of isthmus east of Yaeabu-dake
(18)(photo 950-124)
Cultivation on fine Shioya sandy loam on flat land somewhat back of sea. This grades back toward higher land into a very dark fine loam, certainly like arnoldtoft series in color and in the pale sand underlying about 25 cm. of it. But much finer and silties and apparently quite fertile. Sugar cane growing very well on it.

May 26 - 2.8 km. e. of Yaeabu-dake
(19)(photo 950-124) gravelly littoral Knoll or broken rock and gravel, well drained
Tall Imperata, up to 0.3-1 m tall, dense stand, with some scattered small tufts of Miscanthus floridulus, Thelmeda, Pteridium, Artemisia, Lespedeza cuneata, minor amounts of Sclaria, Lygodium, Osbeckia, Paspalum, Rubus, Ficus (seedling), Phaseolus, Desmodium, Lilium, Melast. (Calyc.), Wahlenbergia, Lophatherum, Andropogon, Labiate, Acacia confusa, Psidium, Rosa, Cyperus, Uraria, Lactuca
This varies locally, some patches being very weedy, and with Imperata only in patches, indicating more recent cultivation.
Across road in thick Imperata are small spots where it has been cut & burned off. Here it looks just like the sparse grass on other side of island. In these spots the Imperata is flowering not elsewhere.

1956 Ryukyus Is

May 27 - 3 km. n. of Banna-dake
~~Yaeda~~ Nagura Valley
(116) (Photo 945-~~92~~)
Patch of forest around shrine.
Rather dense, canopy 10-15 m., mainly of several species of Ficus which have compound trunks and large spreading, often umbrella-shaped crowns, ~~tittle~~ a few ~~no evidence of~~ supporting trunks from large limbs. Macaranga, Melia, Melanolepis, etc. are also part of canopy. Garcinia is planted along walk and to same extent is in the second story. A lower irregular second story made up also of Erodia, Pouteria, Ardisia Diospyros, ~~etc.~~ Morus, Diospyros etc.
Under story of Arenga, in large clumps, the trunks up to 3-4 m. leaves to 5-6 ft.

With this on the ground are alocasia, ferns etc.

Ishigaki

Ardisia
Macaranga
Ficus 3-4 spp.
Morus
Pandanus
Arenga
Garcinia spicata
Melia azedarach
Pouteria glomerata
Melanolepis?
Erodia
Alocasia circulcita
Paspalum conjugatum
Thelypteris unita?
Citrus sp.
Premna obtusifolia
Diospyros maritima

May 27 Shira + Mizu,
head ~~of~~ north branch Nagura ~~River~~, Valley
(17) (Photo 945-22)
flat valley bottom being drained.
Deep peat soil a peaty muck - rather jelly-like but fibrous apparently with grass roots judging by the piles of dead Pandanus
the vegetation must have been Pandanus or Pandanus plus Phragmites
A few small tufts of Miscanthus
Now mostly a wet pasture of Panicum with patches of mixed ferns, sedges, ~~and~~ young Pandanus, Osbeckia, ~~etc~~ Glochidion?, Eriocaulon, etc.
Water draining out in ditches is dark brown

May 27 - Shira Mizugawa.
~~head of Nagura Gawa~~
near head of north branch of Nagura ~~Valley~~
~~marsh~~ marsh on cleared peat land, being drained. 60 m.

3 7132 5		Paspalum abundant locally	culms erect.
6	33	Hedyotis abundant locally	flowers white
2	34	Panicum abundant	bluish green, erect.

1956 Ryukyus 2s

37 135 Eiocaulon
common locally

May 27 - Nagura Valley,
½ mi. n.e. of Nagura, 1.5 km. n. of
in patch of Ficus forest
around shrine

5 36 Macaranga
occasional

5 37 Ficus
occasional

3 38 Alocasia cucullata
abundant in undergrowth

5 39 ~~Evodia~~
common in second story

2 40 Pouteria ~~glomerata~~
rare in second story

5 41 Ficus
one seen.

42 ~~Melothria~~
common in edges of forest

10 m.
Urantia Dahe
~~Bonnadeba~~

small tree, fruit
bluish green, with
soft bright green processes.
spreading tree,
compound trunk,
figs depressed globose,
immature.
stem to 0.5 m. tall, 3-4 cm.
thick; leaves glossy
green, at a slight angle
to petiole; spathe pale
green ~~ish~~ boat-shape
with round bottom.
odor faintly like durian.
small tree 6 m. tall
buds white.
small tree, 6 m. tall;
leaves pale beneath.
large spreading tree
with complex trunks,
fruits on larger branches
extensive vine, with
disgusting odor when
crushed, ~~fruits~~ flowers
greenish yellow; fruit
immature, green with white
stripes (red with white when ripe).

1956 Ryukyus)s.

37143 Ardisia ~~sandal~~ edge of forest

5 ~~44~~

small tree; flowers pinkish white; even large branches snapping off very readily ~~at~~ in abscission planes.

5 H4 Diospyros maritima Bl. edge of forest

small tree; flowers cream white.

same - cultivated field.

6 45 Oryza sativa L. (dry land cultivation)

erect

May 27 ~~Kuroiwa~~ Fu Saki on chert cliffs exposed to sea

5 m.

2 46 Hedyotis in crevices

fleshy

2 47 Pouteria ~~glomerata~~ on top of cliff

low bush, under 1 m. tall; leaves pale beneath.

1950 Ryukyus Is.

May 28 - 1.5 elev. s.w. of Kabira

(19) (photo 950-45) Gulch bottom in forested area.

Mixed scrub 4-5 m tall dense, forming a full canopy, tangled with vines, with ferns, Piper, Oplismenus, Alocasia, and many seedlings in under growth.

Main shrubs are ardisia, Psychotria, Maesa, Arenga, Zanthoxylum. Evodia, Lasianthus, (Rubiac), Bachmeria, Neolitsea

Vines - Flagellaria, Smilax, Caesalpinia, Piper, Elaeagnus, Lasianthus

Larger ficus trees as emergents.

(20) Steep slope of side ravine - still a scrub forest but with general height perhaps 6-8 m. and more large trees, mostly Ficus.

Undergrowth so dense as to necessitate a machete. Vines are bad, especially Smilax, the basal parts of which are somewhat prickly.

(21) Pine woods on steep slope - few other trees mixed in. Pines are 10-20 cm. diam. 10-15 m. tall. Thin Miscanthus with shrubs covers ground. Many large boulders.

1956 ~~Ryukyu~~ Is.

May 28 1.5-1.7 km. east of Yoshihara, ~~south east~~ east of Kabira-wan (22) (Photo 549-61)

Low dense forest about 10 m. tall, full canopy, trees mostly small, trunks up to 20 cm. rarely banyans with complex trunks much larger. Ficus is the most abundant genus in canopy layer. but with some others.

Dense undergrowth with ferns, Psychotria, Urticaceae, Lasianthus, Ardisia, ~~Elaeophyllum~~ Aglaonema, Diospyros, Alocasia,

abundant vines Flagellaria, Aristolochia, Caesalpinia, Smilax, Piper, aroids.

ground bare in dense parts, thinly covered by dead leaves. Piper vines, etc.

A few tall Cyathea or tall Livistona seen.

This is on a sand underlain by sandy limestone which comes to the surface frequently. The reaction of the sand is pH 7.5-8. The situation is a gently sloping terrace dissected by broad shallow ravines.

Some large old rotting stumps in thick forest.

Stumps in clearing 1-5 m. apart, mostly 2-3 m.

In clearing a rank second growth 1-3 m. tall or taller of Melia, Liptunus, Macaranga, Ficus, Rhus, Nephrolepis etc. tangled with Capparis, Vitis or Ampelopsis, Caesalpinia (small stipules), Clematis.

clearing in ~~Gardenia~~ Canna,

1956 Ryukyus Is.

May 20 - ~~Ft~~ beach west north west of YCAT compound, west northwest of Ishigaki city. The beach ridge, held in places by a low sea wall, is covered by a beach scrub, quite dense, composed of:

Scaevola sericea
Pandanus
Clerodendrum inerme
Hernandia sonora
Thespesia populnea
Hibiscus tiliaceus
Wedelia biflora

at the edges and in openings are

Vigna marina
Thuarea involuta
Ischaemum mutticum
Digitaria sp.
Ipomoea pes-caprae

1950 Ryukyu Is.

May 28 – 1.5 km. S.W. of Kabira
0.5 km. S. of mae Take
in dense low wet scrub
forest in ravine

37148 5		Ficus benguetensis Merr. ? common on steep slopes	40-60 m. small tree, fruits borne only in dense hemispherical clusters on the proximal few cm. of the roots & absolute base of stem, immature.
5	49	Neolitsea occasional	— shrub 2-3 m. tall,
5	50	~~Ilex~~ occasional	— fruit immature. shrub ~~1.5 m.~~ 2 m. tall
2	51	~~Eurya~~ occasional	shrub 2 m. tall
2	52	Ardisia ~~crenata~~ common ?	shrub 3 m. tall (often taller); flowers pinkish white.
3	53	occasional	shrub 3 m. tall; fruit immature.
5	54	Thelypteris common	rhizome creeping, fronds erect, arching at tips.
5	55	Carmona retusa ~~rare~~ occasional	arching, semi-scrambling shrub 3 m. tall; fruit orange-red when ripe.
5	56	Ardisia ? ~~crenata~~ common	— shrub 2.5 m. tall; fruit immature
5	57	Psychotria liukiuensis Hay. very common in undergrowth	— shrub 1.5 m. tall, flowers greenish, stigmas and stamen-beards white.
5	58	common in undergrowth	— shrub 1-1.5 m. tall; leaves glossy and prominently veined above.

ISHIGAKI ISLAND,

1956 Ryukyu Is.

37159 Maesa tenera Mez
common

same - steep mountain side, in forest — 100 m.

5 60 ~~Eholiantha~~ Lasianthus glabra (Rumph.) Makino
rare

shrub 2 m. tall, fruit immature.

shrub 1 m. tall, fruit green. Green wood with a very pleasant resinous odor when crushed.

May 29 — 2.5 km. s.s.w. of Kabira

(24, 25) (Photo 950-65)
Dense stand of young pine with scattered older pines, some admixture locally of broad-leaf species.

(26) (Photo 950-65) 2.5 km s.s.w of Kabira
Ridges and slopes with scattered pines in thicket of broad-leaf species.

May 29 — ca 1.8 km. s.s.w. of Kabira

(27) (Photo 950-65)
Grassy steep ridge. The grass is mainly Imperata, moderately dense, with scattered pine seedlings 3-5 dm. tall, rather abundant, and scattered low bushes of Eurya, Glochidion, Osbeckia, Vaccinium, Similax, Rhododendron, Psidium and several other species. Dianella, Evolvulus, Lcleria, Lygodium, Rhynchospora rubra, Desmodium sp., ~~Labiate~~ acanth., Blumea, Pteridium, Gleichenia, Thelypteris. Some invasion of Miscanthus. This ridge has evidently been burned a couple of years ago. Some charcoal in soil.

1956 Ryukyus

Up the ridge pines become frequent. One about 25 cm. and 1 about 20 cm. were recently cut. Some others still standing are about 30 cm. dbh. Those cut were about 35-40 years and 25 years respectively judging by rather unsatisfactory ring counts.

Here the ground cover becomes predominantly miscanthus, with some Imperata, some Ligularia and less but larger shrubs.

Ridge from peak to next peak covered by a low gnarled ridge-top scrub forest with habit of cloud forest but not mossy. Many genera represented whole fort more than 4-5 m. tall.

Viburnum
Myrsine
Psychotria
Raphiolepis?
Podocarpus
several Lauraceae

Vaccinium
Antiderma
Dendropanax
Quercus
Distylium

(23) grassland with scattered pines, scattered small bushes - Psidium, ~~Osbeckia~~, Rosa, Melastoma

Imperata, Sporobolus, Elephantopus mollis, Centella, Paspalum, Fimbristylis, Setaria, Lygodium, Cyperus,

1956 Ryukyu Is.

Secondary-thicket perhaps 4 m. high, of Pandanus, Glochidion, a little Rhus(?) and Euryа Ficus, Mallotus + several scrub shrubs.
Undergrowth in thinner spots of Thelypteris gongilodus, Alpinia speciosa, Scleria, + spp of Lygodium.

This is a wet low place.

May 29 - mouth of Nagura-gawa wet sand flats covered by a pure stand of Fimbristylis

May 29 - Beach southwest of Nagura-gawa sand ridge at top of beach - covered by a low scrub about 2-3 m high of Scaevola, Hibiscus, Pandanus, Clerodendrum, Messerschmidia, Morus, Miscanthus, Cenna.
Openings and a strip at top of beach covered by Ipomoea pes-caprae, Vigna marina, Ischaemum, Spinifex, Artemisia, Thuarea, Wedelia, Euphorbia, Jussia(?), Vitex, Imperata, Cirsium, Rosa.

May 29 - coast 3 miles n.w. of Nagura, just s.e. of Mijunu Taki

37161 Angelica ~~Kiusiana Maxim.~~ ? 2 m. scape 1.2 m. tall, leaves on fruiting plant dead, leaves of specimen from a sterile rosette nearby.
5 common along seashore on banks above salt marsh

~~Oct~~ ~~Nov~~ May 29 - mouth of Nagura R. Gawa 0 m.

9 62 Fimbristylis coespitose
pure stand on wet sand flat, inundated by tide.

May 29 - ~~1-2~~ 2-2.3 km. ~~s.~~ w.s.w. of Kabira, 0.6-0.7 km. s. of Mae Take

swampy thicket 60 m.

11 63 Glochidion scrub trees 3-4 m. tall; flowers yellow.
~~scrub trees 3-4 m tall~~
co-dominant with Pandanus

6 64 Lygodium fronds twining, much branched, pinnules somewhat glaucous.
climbing in edge of same 60 m.
in edge of dense young pine woods

7 65 ~~Cult~~ Wendlandia formosana Cav. shrub 3 m. tall, flowers white

2 66 Phyllanthus shrub 1.3 m. tall; fruit red.
common

2 67 ~~Toxicia~~
rare in trail

~~67~~

(over)

		same - in grassy meadow with scattered pines	70 m.	
3	7168	Rhynchospora rubra (Lour.) Makino common		
1	69	Lilium longiflorum Thunb. rare		erect, flower horizontal, white, fragrant.
		same - on steep grassy slope with scattered bushes and pine seedlings	175 m.	
1	70	Spathoglottis rare		flowers magenta-purple
1	71	Smilax china L. forma integerrima Kawamoto - Act. Phytotax. 1959 common		tangled shrub 1 m. tall, fruit immature
1	72	Blumea rare		
5	73	Dianella common		flowers deep shiny blue, segments reflexed, fruit dark blue.
7	74	Vaccinium rare		shrub 0.7 m. tall; fruit immature
2	75	Glochidion common		shrub 0.3-0.4 m. tall; flowers yellow.
1	76	~~(illegible)~~ occasional		flowers pink
		same - on steep grassy slope among pines	140 m.	
	77	common		shrub 1 m. tall

(over)

same - in dwarfed ridge-top forest

37	178	Daphniphyllum teijsmanni (var. obionense)	200 m. small tree, fruit immature
5		occasional	
5	79	Viburnum japonicum (Thunb.) [illegible]	shrub 3 m. tall,
		common	— fruit immature.
5	80	Myrsine stolonifera	small tree 4 m. tall,
		common	— fruit immature
5	81		shrub, fruit immature.
		occasional	
2	82	Viburnum japonicum (Thunb.) [illegible]	shrub 1 m. tall, fruit immature
		common, edge of forest	—
7	83	Vaccinium bryanthoides H.L.L.	bush 2 m. tall
		edge of forest	— fruit immature.
2	84	Ilex pedunculosa H.L.L.	small tree 4 m. tall.
		rare	
3	85	Cinnadenia lobulosa E. [illegible]	small tree, leaves
		common	very glaucous beneath.
1	86	Camellia brevistyla Hayata	small tree, sterile.
		common	
3	87	~~Psychotria?~~ Tuberculata	shrub 1 m. tall
		rare, edge of forest	buds greenish, unopened, (slightly contorted?)

1956 Ryukyus 12.

May 30 - head of north fork of Nagura Valley, Mouth of 4th gulch

(28) Secondary thicket 5 m. m. high, very dense, on raising terrace. (Photo 950-14)

Schima, Trema, Cyathea, Pandanus, Maliotus, Macaranga, Casuarina etc. Stems slender, not more than 8 cm. rarely to 13 cm.

Blechnum, Gleichenia forming to be undergrowth also another large fern.

Schima is most abundant.

(29) (Photo 950-12)

Soil a yellowish sand underlain by clay.

Up the valley between the two almost parallel banks of the stream, the thicket does not change much, perhaps gets taller, and species become much more numerous. The ground gets less sandy and more a mixture of reddish clay and rounded large boulders. After the ground rises sufficiently that

deep dissection becomes apparent Quercus becomes rather abundant and the secondary species tend to drop out.

Strangely enough, to this point, at least, Ficus is not common.

(29a) (Photo 950-14) Upstream the forest reaches a height of 10 m. is quite mixed in composition, with Quercus common. Trees mostly rather small

Bare looking spots in photo are patches of Dipteris Gleichenia and a little Macaranga on steep slopes.

1950 Ryukyu Is.

May 30 – gulch of northern fork of Nagurd-Gawa above Dadifu in dense low scrubby forest 120-150 m.

37188		Sphenomeris on wet rocks in gulch bottom	large dense clumps, fronds arching; ascending shrub, figs immature
2	89	Ficus rare in wet gulch bottom	sapling 1.5 m. tall, sterile (other seen 3 m. tall).
2	90	Podocarpus nagi rare on wet gulch wall	distinct trunk 4 dm. high 4-5 cm. thick.
5	91	Callicarpa in wet gulch bottom	shrub 2 m. tall, flowers pinkish white.
2	92	Ficus common on wet gulch wall	flowers white, lip with 2 pink stripes; rhizome with peppery odor, pleasant.
1	93	Ardisia occasional on wet gulch wall	shrub 2.5 m. tall, flowers pinkish white.
1	94	Alpinia ? rare on wet gulch wall	
1	95	Ardisia occasional in wet gulch bottom	
3	96	Psilotum nudum (L.) Griseb. epiphytic on tree trunks in wet gulch bottom, rare.	
1	97	Ophiorrhiza on wet rocks in gulch bottom	
2	98	on wet rocks at bottom of deep gulch	fronds bent downward
3	99	on wet rocks at bottom of deep gulch	
37200		on wet rocks at bottom of waterfall in deep gulch	dark green

ISHIGAKI ISLAND.

37201 (sub.) Lasianthus ~~p~~ lagiophyllus Hance
5 common on wet rocks in bottom of deep gulch — ~~co~~ low shrub; wood foetid when crushed.

1 02 (sub) rare on wet rocks in bottom of deep gulch — shrub 0.3 m. tall; buds white.

03 Eurya yaeyamensis Hatus. — small tree; leaves convex; fruit immature.
common in bottom of wet gulch

6 04 ~~Styrax~~ Adinandra yaeyamensis Hatus. — 100 m small tree, flowers pinkish white
damp gulch bottom

1 05 Korthalsella opuntia (Thunb.) Merr. — joints of branches flattened in plane opposite that of main ~~branch~~ stem.
damp gulch bottom, parasitic on Styrax (37204)

1 06 (~~subst~~) Tashiroea yaeyamensis Matsum. — shrub 0.5 m. tall, flowers pink.
rare in damp gulch bottom along stream

6 07 ~~Myrsine~~ Tashiroea yaeyamensis Matsum. (W. & A.) Hara — small tree; fruit immature.
rare in damp gulch bottom

5 08 Gleichenia linearis ~~Burm.~~ — forming tangles
var. fernginea
common in damp gulch

3 09 Sarcandra hristyla var. oldhamii (Miq.) Rem.-Jeff. — small spreading tree, flowers pink.
rare in damp gulch
same, below Dadifun

3 10 Korthalsella opuntia (Thunb.) Merr. — 60-80 m branches flattened in plane opposite that of stem.
rare in gulch bottom

7 11 Quercus cuspidata Thunb. — fruit immature. spreading tree 10 m. tall, leaves with peculiar bronze sheen beneath. I see no reason for putting this in Castanopsis.
common on slopes

Castanopsis cuspidata (Thunb.) Schottky

~~Apr~~ 1950 Ryukyu Is

3	7	2	12 (sub.) rare on slopes
2			13 (sub.) rare on stream terrace
5			14 Elaeocarpus sylvestris rare on stream terrace
2			15 (asclep.) rare on stream terrace
5			16 Ardisia occasional on stream terrace
4			17 Psychotria rubinensis occasional in undergrowth, on stream terrace
5			18 common on stream terrace

May 31 - 2.5 km. s.w. of Kabira

(30) (Photo 950-122)

Small hills, covered on north side with scattered pines in low secondary thicket, on south sides with Miscanthus, this also over the tops.

The thicket of Mallotus, Ficus, Glochidion, Casuarina, Macaranga, etc. with Smilax, Ampelopsis, Rubus, other vines, and with

shrub 1 m. tall; fruit immature.

— shrub 2 m. tall.

small tree 5 m. tall, buds only.

— vine with milky sap, fruit green. flowers unknown.

— small tree 3 m. tall,

40m shrub 1 m. tall, flowers pale greenish.

small tree 5 m. tall.

a tall lanky growth of Miscanthus wherever the canopy is a bit loose.

Except where the canopy is very dense and at least 5 m. high this thicket is penetrated only with great labor. Ferns are numerous on the ground.

The Miscanthus on the summits and open slopes is about 3 m tall, very dense, can be pushed through, but with great expenditure of energy

1956 Ryukyu Is

May 31 1.2 km
3/4 mile south of Kabira

(31) (Photo 950-65)
Small terrace, with loose Miscanthus a few pines, scattered shrubs of various sorts. Much Gleichenia and Pteridium. Some Pandanus.

Across road vegetation of pines 10-15 cm dbh. & 8-12 m tall.
Open beneath with grass, ferns, Miscanthus and low shrubs.

Futaba, 1.2 km:
May 31 3/4 mile south of Kabira
Thin growth of Miscanthus and bushes on old terrace.

37	19	Eurya occasional
4		
5	20	occasional
7	21	Eurya occasional
6	22	Glochidion common
8	23	Musaenda common in (over) thicket

40 m.

shrub 1.5 m. tall,
– fruit immature.
shrub 2.5 m. tall,
– fruit dry.
shrub 1.5 m. tall,
– leaves convex; fruit immature
shrub 2 m. tall.

scandent shrub, enlarged calyx lobe white, caducous.

same - in undergrowth in pine plantation 20 m.

37 224 Pteris dispar Kunze P. semipinnata var. dispar (Kunze) Baker
5 common tufted

1 25 Sarcandra glabra (Thunb.) Nakai
rare subshrub 0.5 m. tall, filament fleshy, enlarged.

5 24 Axonopus compressus (Sw.) Beauv.
common culms spreading from center.

1 27 Pteris cretica L. P. ryukyuensis Tagawa det. C.V. Morton
rare

1 28 Pteris fauriei Hieron.

May 31 - ~~3~~ 3 kam. s.s.w. of Kabira, near Tsusutumi Mori in second-growth thicket 100 m.
undergrowth

2 29 (unl.)
occasional weak shrub 1.5 m. tall.

4 30 ~~Neoplatain~~
rare in Shira Hama, e. of Kera Saki subshrub 0.5 m. tall, flowers white.

May 31 - 2.5 ~~miles~~ kam. n.w. of Nagura along coast 2 m.

5 31 Cladium chinense Nees
forming pure stand in marshy place ascending culms ~~connected by~~ from prostrate rhizomes.

6 31a Rhynchospora corymbosa
in marshy place

June 1

(32) (Photo 940-101)
Small patch of swamp forest in bad wet spot where small stream issues from base of mountains.

(33) Sloping ridge between two deep ravines, of volcanic rock, basalt (?) below, breccia above.
Wooded but badly disturbed and logged out. Some fairly large trees 3-4 dm. dbh. but very crooked and not over 10-12 m. tall.
Numerous species, incl. some of Andiaia, Camellia, Diospyros, Garcinia spicata, etc.
Shrub layer pronounced but not hard to walk through. Psychotria common.
Vines, Smilax, etc. common at low altitude but dropping out above.
Many ferns.

This forest is quite ragged looking with some secondary species such as Mallotus sp.
Almost no epiphytes except small liverworts, mosses and lichens.
Rocks thinly mossy.

Ficus not abundant.

(34) (Photo 940-100)
Higher ridge on slopes just below Nozoki-Dake
Thicker woods, less disturbed, but much smaller trees, mostly less than 1 dm. dbh.
A few large Ficus, etc. Some Quercus. Podocarpus
Canopy almost complete, about 10 m.

Undergrowth very low, less than 1 m. but luxuriant, with Sarcandra and Psychotria, many other shrubs, seedlings, many ferns, creeping aroids, etc. Some Selaginella. Quite wet.

(35) (Photo 940-101)
Base of steep rock face on north side of peak of Nozoko-dake. Bare lava, shaded by trees, wet, with a few ferns and other herbs, including a yellow-flowered Lysimachia.

June 1 - northwest slopes of Nozoko-dake. 200-230 m.

in wet broad-leaf forest

37232 Tarenna ?
rare

1 33 Garcinia
occasional

1 34 Pyrrosia
on large boulder

5 35 Psychotria serpens L.
rare, one colony seen on boulder

1 36 Alpinia
rare

5 37 Lysimachia
local on base of steep bare, smooth wet lava rock, shaded

3 38 Peperomia
rare on steep bare smooth wet lava rock, shaded

1 39 (orch.)
rare, terrestrial

shrub 1 m. tall, buds white.

straight tree 8 m. tall, lower branches sterile; flowers picked up from ground.

— forming loose mat.

— creeping, branches; flowers white.

flowers white, lip with 2 pink stripes.

— flowers clear yellow.

stems ascending fleshy, leaves fleshy, pale beneath, dark green above

— flowers white.

June 1 - ridge northwest from Nozoki-ga-Dake
indegraded moist forest

37-40 Eurya
5 locally

5 41 (rub) occasional

2 42 Camellia
occasional

5 43 (grass) rare along trail on slope.

June 3 - Todoroki-gawa,
1.3 km. w.s.w. of mouth
Marsh on heavy fossiliferous clay. Paracalamus most abundant. Eclipta, Wedelia, Polygonum, Ancilema, Cyperus 3 spp., Potentilla, Hydrocotyle, etc.
Heavily grazed. Hummocky. Water channels between hummocks.

1.5 km. s.w. of mouth of Todoroki-gawa
Terrace of hard Ryukyu limestone underlain by an argillaceous fossiliferous limestone. Surface boulders look to be arranged by human agency. Collected fossils.

~~80~~ 100-150 small tree 5 m. tall; fruit immature
- shrub 1.5 m. tall; fruit flashy, bright blue.
- tree 10 m. tall, 1 dm. dbh. dry fruit on tree.
- caespitose, ~~cupl~~ panicles stiff; roots tuberously enlarged and clavate distally.

June 3 - Todoroki-gawa, 1.3 km. w. of mouth

Limestone cliff with fossil bearing "caré".
Covered by thicket of Melia, Ficus, Mallotus, Erythrina, Hibiscus tiliaceus, etc.
Undergrowth of Alocasia.
Araceous vines common.
Clerodendrum, Pandanus

1956 Ryukyu Is.

June 3 - 1.3 km. slightly south of west of mouth of Todoroki-gawa.

on roadside in cultivated land. - 50 m.

37 244 Verbena officinalis L.
5 common — flowers lavender

2 45 ~~Cat~~ Cardiospermum halicacabum
rare — flowers white.

4 46 Hibiscus abelmoschus
occasional — herb up to 1 m. long, ascending, flower light yellow, stigmas dark maroon-black.

same - in hummocky marsh on heavy clay soil. 40 m.

5 47 Cyperus
occasional to common — single culms, erect, from rhizomes.

1 48 Wedelia
rare — flowers yellow

1 49 Potentilla
rare — petals yellow

1 50 Polygonum
occasional — flowers greenish white.

1 51 Cyperus brevifolius
common — heads green.

2 52 Cyperus
occasional

7 53 Dactine
abundant, forming hummocks

same - on bank of Todoroki-gawa 40 m

4 54 Sambucus
forming pure stand on river bank — shrub or giant herb 2 m. tall; panicle flat, flowers white.

IRIOMOTE ISLAND.

1950 Ryukyus 7.

same - in water in edge of rice field

37 x 55 3 Marsilea quadrifolia L.
common

June 3 - Todoroki + Gawa, 1.3 km. w. of mouth
thicket on and at base of low limestone cliff.

5 56 ~~Mallotus~~ ? No. Archboldiodendron trunk 1½ m. [illegible] Ian Formosana Pax?)
common in edges of

7 57 Capsicum frutescens L.
in undergrowth in

5 58 Ficus
common in

3 59 Vitis
climbing in

x 60 Clerodendrum
common in

June 3 - top of hill 1 km. w.s.w. of Kara-dake

3+ 61 Bothriochloa intermedia (R. Br.) A. Camus
rare, with other grasses on open hill top

40 m.

schizaea creeping on mud, leaves floating.

50 m.

shrub 1 m. tall
shrub 1.5 m. tall, flowers nodding, greenish white, stamens dull blue; ripe fruit scarlet.
small spreading tree, fruit dark red.
vine, in bud only, leaves white beneath.
small tree, flowers white with pink stamens and red corolla tube, calyx pale green.

136 m.

caespitose, culms spreading at base, then ascending

193a 1956 Ryukyus Is.

June 3 - Hill 2 km. south of Kara-dake
Hill of schist, with black soil.
Covered by grass, with a few shrubs of 2 species of Eurya and Osbeckia chinensis, with Dianella, on north side.
The grass is predominantly Imperata, with some admixture of two species of Andropogon and Paspalum conjugatum and a few other species, some Miscanthus at the top. The Imperata is mostly rather luxuriant and dense, well over knee high in most places. Evidence of light grazing. Grazing pattern not apparent. On a hill nearby, fenced and with much stock, the grazing pattern is very clear.

19 198

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